Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

Miss Florence Hedges,
Laboratory of Plant Pathology,
U. S. Department of Agriculture,
Washington, D. C.

U. S. HORTICULTURAL STATION
RECEIVED
MAR 2 7 1941
LIBRARY
BELTSVILLE, MARYLAND

Soybean p. 186

Bact. vignae p. 187.

THE PLANT DISEASE REPORTER

Issued By

The Office of Plant Disease Survey
and
Pathological Collections

Supplement 40

Diseases of Cereal and Forage Crops
In the United States in 1924

May 10, 1925

BUREAU OF PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

DISEASES OF CEREAL AND FORAGE CROPS IN THE UNITED STATES IN 1924

Prepared by L. E. Melchers, Plant Pathologist, Kansas Agricultural Experiment Station and Collaborator, Plant Disease Survey.

Plant Disease Reporter
Supplement 40

May 10, 1925

CONTENTS

- Introduction 107
- Diseases of cereal crops 110
  - Wheat 110
    - Bunt 110
    - Loose smut 114
    - Stem rust 118
    - Leaf rust 124
    - Fusarium blight (scab) 128
    - Rosette 130
    - Take all 131
    - Footrot 133
    - Other foot and rootrot diseases 134
    - Ergot 135
    - Stripe rust 135
    - Anthracnose 135
    - Powdery mildew 136
    - Blackpoint 136
    - Glumeblotch 137
    - Blackchaff 137
    - Speckled leafblotch 138
    - Nematode 139
    - Flagsmut 139
    - Other diseases and injuries 140
  - Rye 141
    - Stem rust 141
    - Leaf rust 142
    - Ergot 143
    - Anthracnose 144
    - Powdery mildew 144
    - Scab 145
    - Stem smut 145
    - Loose smut 145
    - Other diseases 145
  - Barley 146
    - Stem rust 146
    - Leaf rust 147
    - Stripe rust 147
    - Covered smut 147
    - Loose smut 148
    - Stripe 150
    - Spotblotch 151
    - Netblotch 152
    - Scald 152
    - Scab 152
    - Other diseases 152
  - Oats 153
    - Smuts 153
    - Blast 155
    - Crown rust 156
    - Stem rust 158
    - Halo blight 159
    - Foot and rootrots 159
    - Scab 160
    - Leafspot 160
    - Other diseases and injuries 160
  - Corn 161
    - Smut 161
    - Dryrot 164
    - Root, stalk, and ear rots 164
    - Rust 166
    - Bacterial wilt 167
    - Brownspot 167
    - Other diseases 168
  - Rice 169
  - Flax 170
    - Wilt 170
    - Rust 170
    - Pasmo 170
    - Other diseases and injuries 171
  - Sorghum 172
    - Covered kernel smut 172
    - Kernel smut 172
    - Other diseases 172
  - Sudan grass 173

Diseases of forage crops.......... 173
- A. Legumes.......................... 173
  - Alfalfa.......................... 173
    - Leafspot........................ 173
    - Yellow leafblotch.......... 174
    - Downy mildew............... 174
    - Nematode..................... 175
    - Bacterial blight........... 176
    - Dying......................... 177
    - Rootrots...................... 178
    - Other diseases and injuries................... 179
  - Clover............................ 180
    - Anthracnose................ 180
    - Powdery mildew........... 181
    - Rust............................ 182
    - Rootrots..................... 183
    - Other diseases and injuries.............. 183
  - Sweet clover............... 184
  - Cowpea........................ 185
    - Bacterial leafspot. 185
    - Other diseases and injuries.............. 185
  - Soybean....................... 186
  - Velvet bean.................. 187
  - Horse bean................... 187
- B. Grasses.......................... 188
  - Timothy........................ 188
  - Miscellaneous grasses. 188

INTRODUCTION

A summary of the cereal and forage crop diseases which have been reported in the United States in 1924 is herewith included. The general scheme which has been followed in other reports has for the most part been used in this one. The information on the occurrence, prevalence, and importance of these diseases has been obtained from the records submitted by the several collaborating states, the Office of Cereal Investigations, and the Plant Disease Survey records. In addition to this an attempt has been made to cite all important literature published in 1924 bearing on the cereal and forage crop diseases.

This report has been made as concise as possible. It is realized that in some cases more extended discussions and conclusions might have been desirable, but the limitations of space and time made this impossible.

There were no important epidemics of cereal or forage crop diseases in the United States in 1924. The cereal rusts were conspicuous by their absence. While wheat bunt was not a very important factor in all the wheat growing states, it was serious in a few states such as Kansas, Washington, and Idaho. Apparently the flag smut situation has not increased in seriousness in the United States the past year. This holds also for take all and the nematode disease of wheat. The importance of corn diseases which are collectively causing a large annual loss in the corn belt is being recognized more fully each year. Several new alfalfa diseases which are not fully understood are appearing in several states. Undoubtedly it will be found that several root diseases are responsible for some of the reduced acreage in alfalfa growing states.

Several new cereal and forage crop diseases have been reported for the first time in the United States. Some of these are new to science.

A number of States have reported diseases for the first time as occurring within their boundaries.

The accuracy of this report depends for the most part on the accuracy of the data supplied by the collaborators. There is, of course, no method of determining absolutely the actual loss caused by these plant diseases, and in general the estimated percentages of loss are only approximate. However, as one studies the data which have been contributed by collaborators for the last few years, he is struck by the general agreement in the estimates which have been made. One cannot help but realize, if one has had occasion to consult the records in the Plant Disease Survey, that it is the only complete available source of information on losses caused by plant diseases in the United States.

In working over the annual reports of the various collaborators, great differences were noted in the accuracy, completeness, and general conclusions reached. There seems to be considerable opportunity for improvement on the part of some individuals. If the plant disease survey work is taken seriously, the value of the records will be increased. Each year they are becoming more valuable. It should be the moral duty of the collaborator to try to improve his reports each year, for only in this way will this Survey improve. If the various reports from the collaborators are more carefully worked out, the annual reports will become accurate, complete, and satisfactory.

NEW DISEASES

(See following text for details)

The following are some of the organisms found in 1924 for the first time to be the cause of cereal and forage crop diseases in the United States.

Corn

Helminthosporium sp. (leafspot), Florida, Philippine Islands.
Helminthosporium sp. (stalk canker) Georgia.

Rice

Ophiobolus sp., Arkansas.

Alfalfa

Macrosporium sarcinaeforme Cav., Illinois.

Milo

Sphacelotheca sp., Kansas, Texas, New Mexico.

Clover

Ascochyta imperfecta Pk., Illinois.
Bacterium trifoliorum Jones, Williamson, Wolf, & McCul. Reported from several states.

Soybean

Septoria glycines (?), Delaware.
Rhizoctonia solani Kuehn, Indiana.

Velvet Bean

Bacterium vignae Gardner & Kendrick, Indiana.

Red Top

Helminthosporium sp., District of Columbia.

DISEASES FOUND IN NEW LOCALITIES
(See text for details)

Note: This is only a partial list of some of the more important diseases and is not to be considered complete; neither does the list include the organisms occurring on miscellaneous grasses.

Spelt

Colletotrichum graminicolum (Ces.) Wils., (C. cereale Manns. & Taub.), Illinois.
Gibberella saubinetii (Mont.) Sacc., Illinois.

Wheat

Bacterium atrofaciens McCul., Pennsylvania.
Tylenchus tritici (Stein.) Bast., South Carolina, Arizona.

Rye

Helminthosporium sativum Pam., King, & Bak. (leafspot), Pennsylvania.
Septoria secalis Prill. & Delacr., Indiana.
Urocystis occulta (Wallr.) Rabh., Idaho.

Barley

Bacterium translucens Jones, Johnson, & Reddy, Texas.
Claviceps purpurea (Fr.) Tul., Illinois.

Oats

Scolecotrichum graminis Fckl., Illinois.

Corn

Sphacelotheca reiliana (Kuehn) McAlp., New York, Idaho.

Rice

Sclerotium oryzae Cat. (stamrot), Arkansas.

Flax

Phlyctaena linicola Speg., South Dakota.

Alfalfa

Macrosporium sarcinaeforme Cav., Illinois.
Pleosphaerulina briosiana Poll., Illinois.
Tylenchus dipsaci (Kuehn) Bast., several new counties in Colorado, New Mexico, Wyoming, etc.

Sweet Clover

Peronospora trifoliorum D By., Wisconsin.

Cowpea

Phyllosticta phaseolina Sacc., Illinois.

Soybean

Bacterium glycineum Coerper, Mississippi.

Mosaic - Quebec. First report from this section.
Peronospora sojae Wolf, Delaware and Kentucky.
Sclerotium rolfsii Sacc., Mississippi.
Septoria glycines (?), Delaware.

Timothy
Heterosporium phlei Greg., Pennsylvania.

DISEASES OF CEREAL CROPS

WHEAT

BUNT CAUSED BY TILLETIA LAEVIS KUEHN AND T. TRITICI (BJERK.) WINT.

Bunt in the United States in 1924 seems to have been about as prevalent as in 1923. Several states report less, while others report somewhat more. Table 28 shows the percentage loss by states. Kansas, Arkansas, and Michigan report considerably more bunt in 1924. In the Northwest, where bunt is always most severe, Washington reports 2% less than in 1923. Idaho reports the same, namely, 8%. In Kansas there was a marked increase, the loss in 1923 being only a trace, while in 1924 it was 8%. Conservative figures estimated by Melchers indicate "that over $6,000,000 damage occurred." Illinois reports 2.3% and North Carolina 1% in 1924 which is only about one-third as much as occurred in 1923.

In the Northwest, bunt is always a serious problem on account of soil contamination, but the unexpected epidemics in the Middle West are not so easily understood. A glance at the estimates of loss due to this disease in the United States for the last five or six years shows plainly that the bunt problem has become more serious. Even in the Northwest the percentage of loss continues to increase steadily, according to the estimates made. In Kansas the loss the past year is the greatest that has ever been reported, the most ever recorded previously being 5% in 1920.

Table 28. Estimated percentage loss from bunt, 1924.

Percent loss	States
8	Idaho, Kansas
6	Washington
3-4	Arkansas, Michigan
2-2.3	Iowa, Illinois
1-1.5	California, New Mexico, North Dakota, South Dakota, Indiana, Ohio, Virginia, Goergia, North Carolina
.5	Texas, Nebraska, Utah, Pennsylvania
Less than .5	Delaware
trace	Kentucky, West Virginia, New York
0	Connecticut

Reports by collaborators:

Pennsylvania: About $.10 per bushel dockage occurred on smutted wheat. Of 114 fields surveyed bunt is the most menacing of wheat diseases when the losses and dockage are taken into consideration. Over 25% of the fields surveyed, which were planted with seed produced in this state, were infected with stinking smut, and it is safe to say that 20% of these fields had sufficient smut to be docked when the grain was sown. (Kirby)

Kansas: From $.02 to $.15 dockage occurred on a large amount of wheat in Kansas. (Melchers)

Ohio: Bunt is serious this year in southern and southwestern Ohio. Counts have been made showing as high as 50% infection. Where copper carbonate dust treatments have been properly made, excellent control is obtained. (Thomas)

Illinois: Infection general throughout the state. The losses, however, are much less than in 1923. The dockage alone in 1924 amounted to $80,506. It varied from a minimum of $.02 to a maximum of $.15 a bushel, or an average of $.05-1/2. (Tehon)

Colorado: Bunt not as prevalent in spring as in winter wheat. (Learn)

Montana: Damage slight, although infection quite general. This is the first smut in grain I have run across in Lake or Flathead Counties in 1924. Average loss due to bunt of spring wheat less than 1%. Fall planted wheat damage 5 to 10% in some counties. It would appear that infection (fall) came largely from spores in the soil. (Jennison)

Idaho: Bunt is again very serious this year. Infection in treated fields runs from 5 to 50%. Several smut explosions have been reported. (Hungerford)

Washington: The harvest of wheat has already begun in this state, and at first the farmers expected not over 60% of a crop but after harvest operations have revealed at least a 75% crop. Smut, however, is the worst. Some experimental plots conducted by the Department of Farm Crops and Department of Plant Pathology averaged about 35% smut. Last Saturday field counts were made around Pullman and the percentages of smut ranged from 30 up to 65%. One interesting experiment might be called to your attention. Mr. H. H. Curtis last year, under the direction of Dr. Heald, replowed some of his summer fallow and then planted wheat. We find that there is less than 8% smut on the wheat on plowed summer fallow, while fields right next to it on unplowed fallow had 35% smut. It is just another illustration that if farmers want to go to the trouble they could control a large amount of the wheat smut. (Dana)

Losses from field fires have been severe in the Walla Walla section of Washington during the past year. A large number of these fires have been thought to be directly traceable to smut.

Weather relations:

It is well known that comparatively low temperatures and considerable moisture are most favorable for infection by bunt. Undoubtedly such conditions prevailed in those states where considerable bunt occurred in 1924. This was the case in Kansas during the sowing season. Weniger reports unusually cool weather at seeding time in North Dakota. In Idaho weather conditions in the fall of 1923 were favorable for soil infestation, according to Hungerford.

Varietal resistance:

Colorado: Marquis is susceptible, also Defiance, among the spring varieties, while Kanred and Turkey Red are susceptible among the winter wheats. (Learn)

Minnesota: Only a trace found in Marquis wheat, none in Durham but considerable in Kota and Prelude. (Div. Pl. Path.)

North Dakota: Kota and Prelude most susceptible, Marquis slightly susceptible and Durham is very lightly attacked. (Weniger)

Gaines (1) discusses the testing of more than 500 selections and varieties of wheat on resistance to bunt during the past ten years. He finds that while complete susceptibility prevails in most varieties, resistance is very marked in some. One cross of an immune variety with a susceptible one has produced a wheat of sufficient merit for commercial production. Resistance in wheat to bunt seems to be recessive

Control measures:

Copper carbonate dusting seems to be unquestionably the most practical, economic, and satisfactory method for controlling bunt, and is rapidly replacing all others in sections where the disease is serious. Several states have carried out experimental work for several years before finally recommending this treatment. California, Washington, Oregon, Kansas, Minnesota, Michigan, Pennsylvania, Iowa, and Ohio seem to have adopted copper carbonate dusting as their standard method of bunt control, and Idaho and Indiana are employing it rather extensively in conjunction with other treatments. Undoubtedly, other states are beginning to use this treatment, but no further reports are available.

In the past year several Stations have published results of experiments concerning the use of copper carbonate dusting for bunt control. Some of these publications are listed under literature "not cited."

Recent literature:

Cited:

1. Gaines, E. F. Inheritance of disease resistance in wheat and oats. (Abstract) Phytopath. 15: 51. Jan. 1925.

Not cited:

Anon. Stinking smut. Tests with various control methods. Jour. Dept. Agr. South Australia 27: 776-777. Mar. 1924.

Antonov, S. M. Dusting of seeds as a means of control of stinking smut. Bolezni Rast. 13: 5-12. 1924.

Baker, E. The effect of formalin on the vitality of seed wheat. Jour. Dept. Agr. South Africa 9: 454-457. Nov. 1924.

Barss, H. P. Seed treatment tests in Oregon. U. S. Dept. Agr. Extension Pathologist (mimeogr.) 2: 98-99. Oct. 1924.

Coons, G. H. Control of stinking smut or bunt of wheat. Michigan Agr. Exp. Sta. Quart. Bul. 7: 21-24. Aug. 1924.

Darnell-Smith, G. P. Copper carbonate and the removal of bunt balls from seed wheat. Agr. Gaz. New South Wales 35: 11-12. 1924.

Denmark, Statens forsøgsvirksomhed i plantekultur. Forsøg med afsvampning af vintersaed. Its Meddel. 103. Tidsskr. Planteavl. 30: 639-643. 1924.

Eriksson, J. Betningsförsök med uspulun och supersolfo sasom kampmedel emot stinksot ä vete (Experiments with uspulun and supersolfo against stinking smut in wheat). K. Landtbr. Akad. Handl. o. Tidskr. 61: 607-610. 1922.

Faris, J. A. Factors influencing the infection of wheat by Tilletia tritici and Tilletia laevis. Mycologia 16: 259-282. Nov. 1924.

Fischer, G. J. Steinbrandbekämpfung in Uruguay. (Bunt control in Uruguay). Angew. Bot. 6: 125-140. 1924.

Henning, E. Om betning mot stinkbrand (*Tilletia tritici*) stråbrand (*Urocystis occulta*) och hårdbrand (*Ustilago hordei*) II. Bidrag till formalin-betningen teknik, (Treatment against *Tilletia tritici*, *Urocystis occulta* and Ustilago hordei) II. A contribution to the technics of the treatment with formalin) K. Landbtr.-Akad. Handl. o. Tidskr. 61: 377-407. 1922.

Hungerford, C. W. Smut-control demonstrations in Idaho. U. S. Dept. Agr. Extension Pathologist (mimeogr.) 2: 99-100. Oct. 1924.

Melchers, L. E. and H. B. Walker. The copper carbonate dust method of controlling bunt of wheat. Kansas Agr. Exp. Sta. Circ. 107: 1-14. July 1924.

Miles, H. W. Bunt in wheat and its control. Ann. Rep. Kirton Agr. Inst. 1923: 40-43. 1923.

Ponsard, J. Les poudres fongicides contre la carie du blé. Jour. Agr. Prat. 88: 74-75. July 26, 1924.

Puttick, G. F. Covered smut (*Tilletia tritici*) in wheat. The value of different control methods. Jour. Dept. Agr. South Africa 8: 616-622. June 1924.

Reed, G. M. Varietal susceptibility of wheat to *Tilletia* laevis Kühn. Phytopath. 14: 437-450. Oct. 1924.

Richardson, A. E. V. Treatment of seed for bunt or stinking smut (*Tilletia tritici*). In his wheat and its cultivation. Jour. Dept. Agr. Victoria 22: 459-466. Aug. 1924.

______________ Treatment of wheat for smut. Use of powdered copper carbonate and powdered copper sulphate for control of smut. Jour. Dept. Agr. Victoria 22: 224-230. Apr. 1924.

Ross, H. Experiments for the control of bunt. Agr. Gaz. New South Wales 34: 780. 1923.

Salmon, E. S. and H. Wormald. The prevention of bunt in wheat. Jour. Min. Agr. Great Britain 30: 918-925. Jan. 1924.

Thomas, R. C. Control of stinking smut or bunt of wheat with special reference to dust treatment. Mo. Bul. Ohio Agr. Exp. Sta. 9: 22-27. 1924.

Tisdale, W. H. Experiments on seed treatment at Arlington Farm. U. S. Dept. Agr. Extension Pathologist (Mimeogr.) 2: 104-106. Oct. 1924.

Tisdale, W. H., John H. Martin, Fred N. Briggs, W. W. Mackie, H. M. Woolman, D. E. Stephens, E. F. Gaines and F. J. Stevenson. Relative résistance of wheat to bunt in the Pacific Coast States. U. S. Dept. Agr. Bul. 1299: 1-29. Jan. 1925.

Verhoeven, W. B. L. Testing of some new German seed disinfectants. Rept. Inter. Conf. Phytopath. and Econ. Entom. Holland 1923: 120-121. 1923.

Westermeier, K. Die Wirkung verschiedener Beizmittel gegen nachträgliche Steinbrandansteckung. (The effect of various disinfectants against reinfection by bunt.) Deutsche Landw. Presse 51: 136. 1924.

Woolman, H. M. and H. B. Humphrey. Summary of literature on bunt or stinking smut of wheat. U. S. Dept. Agr. Bul. 1210: 1-44. 1924.

______________ Studies in the physiology and control of bunt, or stinking smut, of wheat. U. S. Dept. Agr. Bul. 1239: 1-30. 1924.

Zade, Adolf. Die Anfälligkeit unserer Winterweizensorten gegenüber dem Steinbrand. Mitt. Deut. Landw. Ges. 39: 133-134. Feb. 23, 1924.

Zundel, George L. Seed treatment in Washington. U. S. Dept. Agr. Extension Pathologist (mimeogr.) 2: 101-102. Oct. 1924.

LOOSE SMUT CAUSED BY USTILAGO TRITICI (PERS.) JENS.

The figures given in table 29 do not indicate that loose smut was any more prevalent in the United States than has been reported for the last five years, in fact it is evident that in some states the average loss has been greater during the last two or three years.

Wheat - Loose smut

Table 29. Percentages of loss from loose smut of wheat and maximum percentages found in any one field as reported by collaborators, 1924.

Percent loss	State	Maximum percent infection	State
5	Arkansas, Indiana, New Mexico	50	Arkansas
		25	Pennsylvania, Ohio, Iowa
3	Virginia, Maryland		
2	West Virginia, Iowa, Idaho	20	New York, Minnesota, Nebraska
1.5	New Jersey, Pennsylvania, Ohio, North Dakota	15	Illinois
		14	Utah
1	New York, South Carolina, Texas, Utah, Alabama	11	Kansas
		10	Indiana, North Dakota
		5	New Jersey
.5	Delaware, Illinois, Minnesota, Kansas	2	Delaware
		1	Montana
t	Wisconsin, South Dakota, Montana, Colorado	t	Wisconsin

Comments by collaborators:

Pennsylvania: Loose smut on spelt is the first that has been observed. The average amount of loose smut found in each county is as follows: (Kirby)

No. fields	County	Percent loose smut
2	Lebanon	3
2	Berks	3
12	Cumberland	1.99
21	Blair	1.19
8	Chester	.94
27	Lancaster	1.25
14	Delaware	2.46
9	Lycoming	1.88

Virginia: Loose smut is especially prevalent in the eastern parts where wheats of the Fulcaster type are grown. (Fromme)

Arkansas: Very common and destructive. (Young)

Ohio: Appears very abundant this spring. The few counts I have made so far, however, show only 5 to 8% of the heads affected. R. A. Robbins, however, reports 8 to 10% in counties northwest of Columbus. The county agent in Pike County reports having counted 25% loose smut in one field. (Stover)

Illinois: Loose smut rarely seen in fields of spring wheat. (Young)

Nebraska: Much more prevalent than previous reports. Some fields showing 15 to 20% of heads infected. Practically all fields show some, averagingfrom trace to 5%. More prevalent than bunt, probably due to favorable weather conditions. (Goss)

Kansas: Generally present to the extent of one-fourth of 1% in hard wheats. Seldom does it attain higher percentages. In soft wheats of eastern Kansas percentages vary from a trace up to 15%. (Mlechers)

New Mexico: Loose smut on wheat appears to be more common this year also. (Crawford)

Idaho: Important in spring wheat under irrigation. (Hungerford)

Varietal resistance:

Pennsylvania: In the examination of a large number of fields of Forward wheat, no loose smut was found. Apparently it is highly resistant. Forward and Leap are resistant and Pennsylvania 44 and Red Rock are susceptible. (Kirby)

New Jersey: Red Wave showed 3%, Fultz 2%, Dawsons Golden Chaff 5%, Forward 1%, and Red Rock 1%. (Dept. Pl. Path.)

Illinois: In one instance a 35 acre field of Michikoff had from 10 to 15% of the heads smutted. (Tehon)

Minnesota: Prelude and Kota susceptible. (Dept. Pl. Path.)

North Dakota: In many fields of Kota, infection of 5 to 10% has been found. Marquis wheat shows more than last year and Monad about the same as last year. (Weniger)

Control measures:

In general it may be said that any method that attempts to treat all the seed wheat for large areas for the control of loose smut of wheat is impracticable. The only feasible method in regions where loose smut is serious, is one involving a seed plot for increase purposes. In Indiana, which has been a pioneer in advising the modified hot water treatment on a large scale, it has been shown that a seed plot is practically necessary, at least where a considerable quantity of smut free seed is desired.

It is believed that all Experiment Stations, growers of pure seed wheat, or any organization that supplies farmers with seed, should see that it is free from loose smut. For example, the Kansas Station treated all its wheat for loose smut in 1924. No Experiment Station can afford to send out seed that is not free from controllable diseases.

Gregory (1) reports a method which is being used to some extent by farmers in Indiana.

Tapke (4) has made a study on the effect of the modified hot water treatment on wheat. He shows that the physical condition of the seed is a very important factor. This treatment will reduce the germination of seed wheat to zero or nearly zero when the seed coats are broken over the embryo. Increasing the duration of the presoaking period increases the amount of injury from the 10-minute treatment rapidly when the seed coats are broken and relatively slowly when the seed coats are unbroken. Even when the presoak period is not used the 10-minute treatment causes severe injury when the seed coats are broken. Neill (2) has made some recent studies on this subject in which he states:

> "Presoaking in itself does not appear to injure the vitality of the seed, but renders it more sensitive to the action of the higher temperatures in the subsequent dip. There is a slight advantage in a presoak temperature of 84° over a temperature of 63° for five to six hours when germination is commenced on the day following the treatment. With a presoak of five to six hours at 63° the total germination is unaffected by a subsequent dip of ten minutes up to 127°, or five minutes up to 129°. A reduction of 3 to 4 percent takes place in each case by a further rise of 2° and a rapid reduction with a still further rise. The germination speed is in all cases lowered in direct proportion to increase in both time and temperature of dip. Drying quickly, following treatment in an air current of 95° to 100° has no injurious effect on germination, nor when treated seeds are thus dried is there any loss of vitality after storage up to one month."

Rodenhiser and Stakman (3) report successful results in the control of the loose smuts of wheat and barley by the use of Uspulun, Semesan, and Germisan.

Virginia: Good results with hot water treatment applied on farm. Dipping grain enclosed in sacks and barrels. (Fromme)

Indiana: Severe loose smut infection in northern Indiana where it is not generally serious. Fields planted with seed treated in 1922 but not in 1923 were not free from smut. (Gardner)

Recent literature:

Cited

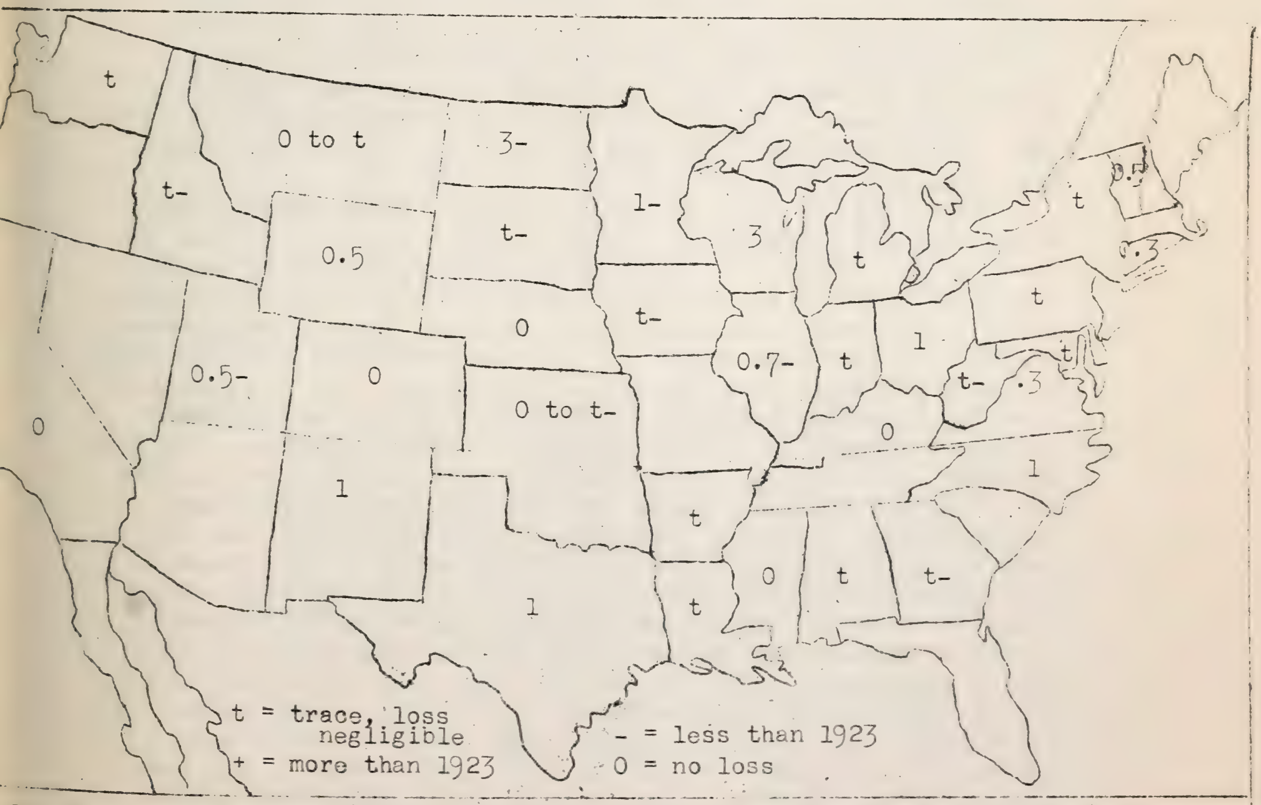
1. Gregory, C. T. Killing the loose smut of wheat. Better Crops 2³: 30-31, 41. May 1924.
2. Neill, J. C. Loose smut of wheat. New Zealand Jour. Agr. 29: 177-187. Sept. 1924.
3. Rodenhiser, H. A. and E. C. Stakman. The control of loose smuts of wheat and barley, and barley stripe by Upsulan, Semesan, and Germisan. (Abstract) Phytopath. 15: 51. Jan. 1925.

4. Tapke, V. F. Effects of the modified hot water treatment on germination, growth, and yield of wheat. Jour. Agr. Res. 28: 79-97. Apr. 5, 1924.

STEM RUST CAUSED BY PUCCINIA GRAMINIS PERS.

Stem rust of wheat in the United States in 1924 caused very little loss. It was not to be compared in this respect with the season of 1919, 1920, or 1923.

North Dakota and Wisconsin, according to reports, had the greatest losses, 3% in each case. Minnesota, North Carolina, New Mexico, Texas, and Ohio, states widely scattered, reported 1%. Virginia and Connecticut each reported 0.3% damage, while 0.5% loss was estimated for Utah, Wyoming, and Vermont. Most of the reports indicate that stem rust was a negligible factor. In the Hard Winter Wheat Belt, Oklahoma did not make a report, but it is believed that no damage occurred in this state. Most damage occurred in the Hard Red Spring Wheat Belt as shown by the map. In all probability a conservative estimate of the total loss caused by stem rust in the United States in 1924 would be less than one-half percent.



1. Percentage losses and prevalence as compared with 1923 of stemrust of wheat, 1924.

Weather relations:

The season of 1924 was rather unusual in many respects, in that it was backward and cool during May, June, and parts of July. Collaborators' reports indicate that the small amount of stem rust on wheat was due to extremely cool weather at some of the critical stages when infection ordinarily would have occurred. In numerous cases cited, as in West Virginia, there was an abundance of moisture but the temperatures were below normal. Minnesota likewise reported an unusually cool spring as did also Kansas and Nebraska and the corn belt states in general. Iowa reported an extremely cool and unusually dry spring, a combination which in itself would not favor rust development. In South Dakota it was unusually dry when the first signs of rust appeared. Undoubtedly, these unusual environmental conditions in states where stem rust ordinarily is severe were important factors in holding it in check in 1924.

Factors affecting the relative severity:

The following quotation is from a report by E. B. Lambert "Report of progress in epidemiology of stem rust of cereals, 1924." Cereal Courier 17: 37-46. Jan. 31, 1925.

> "In Oklahoma, Kansas, Missouri, southern Illinois, and Nebraska, no appreciable loss resulted from stem rust. Infection was first observed in these states during the second and third weeks in June. In this region barberries rusted in May but conditions were unfavorable for abundant infection. The significance of barberry infection in Kansas and Missouri could not be determined, since only a few rural barberry plantings were available for study.
>
> "The rust was first found in Colorado, South Dakota, Iowa, Minnesota, and North Dakota during the last week in June and the first week in July. It was found at Grand Forks, North Dakota, on July 13, and on the Canadian border a few days later. A center of heavy infection developed around Yankton, South Dakota, where the initial infection seemed to have occurred about June 15. Seven barberry plantings were located in this region, but the amount of inoculum spreading from these barberries did not seem abundant enough to account for all of the heavy initial infection. It may, possibly, have been due to a combination of spores blown in from the South and East and spores from local infected barberries. Another center of severe infection existed at harvest time in central North Dakota. Initial infection occurred throughout this region during the second week in July. The heaviest early infection centered around Jamestown and Courteney and extended northwest through the Kenmare region and northeast through the Devils Lake region. Several barberry plantings which were infected were located near Courteney. These were located after the epidemic had become widespread, and therefore it was impossible to determine how much they had contributed to the production of the epidemic. The inoculum which caused the intial infection in this region may have come from several sources, - local barberries, wind-blown urediniospores from northern Kansas

Nebraska, and the Yankton area, or aeciospores from Ohio or possibly as far east as West Virginia, Pennsylvania and New York may have contributed.

"In the eastern portion of the barberry eradication area, with the exception of southernIllinois and southern Indiana, stem rust did not appear on grains or grasses until July. Barberries were heavily infected throughout southeastern Minnesota, Wisconsin, northern Illinois, northern Indiana, Ohio, and Michigan. In this region local epidemics were easily traceable to barberries. In Swift County, Minnesota, stem rust on oats was traced seven miles to infected barberries. In Indiana, during the latter part of June, rust apparently spread twenty-five miles northeast from infected barberries in the area of escapes at Ambia. Stem rust infection was extremely severe on oats near the escaped barberry area at Trempeleau, Wisconsin. During the latter part of July, oats were heavily rusted for eighty miles northwest of this area. In Michigan an area of rusted wheat was found in Gratiot County on July 8. At this time the area comprised less than two acres adjacent to infected barberries. On July 22, the rust had spread to all of the wheat fields in four section. Numerous other examples were noted. Mr. Reddy reported conditions in Michigan as follows:

> 'This has been a wonderful season in Michigan because all rust outbreaks can be directly associated with barberry plantings. We say it is wonderful, because the influence of barberry is so obvious that Michigan farmers having rust are enthusiastic for the eradication of barberries after making a limited number of field observations. It has never been so easy to correlate the rust and the barberries.' "

Statements of collaborators:

Pennsylvania: Stem rust on wheat was first found on July 7 in Chester County. Thereafter the rust was present in every county surveyed. However, only in Cumberland County could the rust be considered of any importance. In that county infected barberries were reported to have spread so much rust to several neighboring wheat fields as to almost totally destroy the grain. It was also observed that fields growing several miles from the barberries had more rust than others in the state. (Kirby)

North Dakota: The season has been very backward and although much wheat was sown fully a month earlier than usual, cold and dry spring wheat weather checked germination and early development very greatly. Wheat is about a week later in development than usual at this time of the year. In Cass County wheat headed generally during the first week in July. In the northeastern and southwesternsections of the state it headed during the second week in July. Stem rust was observed on spring wheat in the Uniform Rust Nursery at Fargo for the first time on July 8, although it had been looked for previously. The amount of infection was very light, about one pustule per rod row. Infection has not spread very much since first observed. Fields of wheat are generally very sparsely infected. (Weniger)

South Dakota: There is a general sprinkling of black stem rust all over South Dakota. A general area of 5 to 10% infection in Spink and Brown Counties may do a little damage but we do not look for more than a very slight loss. There is a small area of about 30% infection in southeastern South Dakota but it will probably do little damage as the wheat is being cut. (Evans)

Nebraska: Stem rust was about two weeks later than usual in making its appearance from overwintering spores in the south. On account of dry weather conditions in April, barberries failed to rust generally. The few light infections which did occur early developed very slowly and could be traced only with difficulty to cereals. The numerous rains during June brought out new infections on the barberries which of course were too late to do any damage to the wheat. In the spring wheat section of the state the weather conditions have been very dry and the rust which is present is developing very slowly and I am sure there will be little if any damage to the spring wheat. (Thiel)

Colorado: In Colorado there was a general infection especially in the spring wheat where the crop was late. The late spring wheat on the dry land in eastern Colorado showed a general epidemic of stem rust ranging from 25 to 30% severity. Most of the spring wheat in the spring wheat area had advanced far enough to escape any serious damage by the rust. (Learn)

An interesting list of the first dates of stem rust infection at Fargo for various years follows. (Weniger)

1919 - June 6
1920 - June 22
1921 - June 13
1922 - June 26
1923 - June 29
1924 - July 8

A general summary of the stem rust situation in South Dakota, Minnesota and North Dakota is given by Messrs. Humphrey, Stakman, and others. (Cereal Courier 16: 173. July 31)

"Dr. H. B. Humphrey, Pathologist in Charge of Cereal Disease Investigations, writes from Doland, South Dakota, on July 26 that with a party consisting of Dr. E. C. Stakman, Donald G. Fletcher, Mr. Hynes, an Australian graduate student at the University of Minnesota, L. W. Melander, and E. B. Lambert, he made an automobile trip from Minneapolis to Fargo, North Dakota, arriving there July 23. Every few miles grain fields were examined and but little stem rust was found. The members of the party made individual notes in different parts of each field and then compared notes. Briefly, the following points were agreed upon: (1) the initial inoculum must have been very meager and therefore but thinly scattered and at widely spaced intervals; (2) the initial infections were few to a given area and apparently dated back to about June 20 to 25; (3) with the exception of about four days of hot, humid weather the growing period for cereals throughout the area visited had been cool and relatively dry; (4) during the few days of rust-favoring weather secondary infection became manifest in scattered uredinia; (5) by the time this secondary infection appeared practically every field of Marquis wheat inspected was in either the soft dough or hard dough stage and really out of danger; (6) barberries, where found, were unmistakably responsible for tributary local infection of grains and grasses; (7) throughout most of the territory visited the barberry field men had found only comparatively few barberries and these were but lightly infected; (8) the greater part of the initial infections may possibly have originated from spores carried in from other states, not necessarily from the South, and precipitated in June by showers during low-pressure periods. This initial inoculum may have come from states as far away as Wisconsin or even from Michigan, Illinois and Ohio."

Varietal resistance:

Several papers bearing on the problem of resistance of wheat to stem rust have been published in the past year.

Hurd (1) has made a detailed study of the relationship of acidity with reference to stem rust resistance in wheat varieties. It is claimed that varietal resistance to stem rust is not related at any stage of development to titratable acid or H-ion concentration. High acidity of the juice does not tend to hinder attacks of the stem rust organism nor does low acidity predispose the plant to the disease.

The relation of the morphological characters of wheat to resistance is discussed by Hursh (2). In addition to fundamental protoplasmic resistance, wheat varieties are said to possess other means of defense against stem rust. The number of leaf hairs and the size and number of stomata are not considered important in influencing the entrance of germ tubes, but the stomatal movements may have some effect in preventing the penetration of the fungus. The rust mycelium is almost entirely limited to certain tissues in the host. Those varieties which have a great deal of sclerenchyma are less likely to be injured by rust due to the mechanical limitation to the spread of the mycelium.

In a paper giving the results of experiments covering a period of eight years on the effect of fertilizers on the stem rust of wheat, Stakman and Aamodt (3) state the degree of physiological susceptibility of susceptible and resistant varieties is not changed directly by the use of different fertilizers, although the morphologic resistance may be changed slightly. While there appears to be only a slight direct effect of fertilizers on the development of stem rust there is sometimes an intense indirect effect. The authors recommend the avoidance of excessive nitrogenous fertilizers and the use of phosphates and potassium fertilizers on soils which need them.

Stoa (4), discussing "The early harvest of rusted Marquis Wheat," states that the proper stage for harvesting rusted wheat appears to be the same as for a normal harvest, which is directly contrary to the usual recommendation.

The progress of barberry eradication in 1924 has been summarized by F. E. Kempton and Lynn D. Hutton (Cereal Courier 17: 13-36. Jan. 31, 1925).

> "During the calendar year 1924 approximately 124 counties were covered in the original survey, approximately 60 counties were surveyed a second time, and the equivalent of 203 counties was covered in resurvey. Original bushes numbering 295,814 were found on 5,250 properties, and 388,632 bushes were destroyed on 6,335 properties. These totals include 4,841 bushes found on 695 properties in second survey. In resurvey, 21,852 sprouting bushes were found and 21,850 were eradicated. Seedlings numbering 847,771 were found in the original survey, second survey and resurvey.
>
> "Summary of results for seven years. In the seven years of the campaign, from April 1, 1918, to December 31, 1924, the equivalent of approximately 796 counties has been covered in the original farm-to-farm survey. The original survey of practically all cities in the entire 13 states has been completed. Of the counties already covered by the original survey, approximately 111 have been surveyed a second time. In continuing the resurvey it has been necessary to revisit the properties in approximately all counties covered by the original survey to June 30, 1923. Original bushes numbering 6,358,343 have been located on 68,465 properties. Of these, 5,813,192 bushes have been destroyed on 67,510 properties. On resurvey, 273,619 sprouting bushes were destroyed from 10,902 properties. In all surveys, 4,607, 142 seedlings were found and 4,548,956 were destroyed. The numbers include 10,106 bushes and 9,579 seedlings found and 10,086 bushes and 9,579 seedlings destroyed on second survey. This makes a grand total of 11,239,104 bushes, sprouting bushes and seedlings found and 10,634,741 bushes, sprouting bushes and seedlings destroyed in all surveys in the entire campaign."

Recent literature:

Cited

1. Hurd, A. M. The course of acidity changes during the growth period of wheat, with special reference to stem rust resistance. Jour. Agr. Res. 27: 725-735. 1924.

2. Hursh, C. R. Morphological and physiological studies on the resistance of wheat to Puccinia graminis tritici Erikss. and Henn. Jour. Agr. Res. 27: 381-412. 1924.
3. Stakman, E. C. and O. S. Aamodt. The effect of fertilizers on the development of stem rust of wheat. Jour. Agr. Res. 27: 341-380. 1924.
4. Stoa, T. E. The early harvest of rusted Marquis wheat. Jour. Amer. Soc. Agron. 16: 41-47. 1924.

Not cited

Carne, W. M. and J. G. C. Campbell. Rust of cereals. Jour. Agr. West Australia II, I: 73-80. 1924.

Ducomet, Vital, and Et. Foëx. Observations sur les rouilles des céréales. Jour. Agr. Prat. 41: 130-132. Feb. 16, 1924.

Eriksson, J. Om uppkomst och spridning af sädesrost ur och genom utsädeskorn (On the origin and dispersal of cereal rusts by means of the seed). Meddel. K. Landtbr,-akad. Experimentalfält 72 51 p. 1902.

Foëx, E. Quelques observations sur le développement des rouilles des céréales dans le Sud-Ouest et le Sud-Est. Rev. Path. Veg. 11: 205-211. July-Sept. 1924.

Foëx, E., Mlle. M. Gaudineau, and M. Guyot. Les rouilles des céréales en 1923 et 1924 dans la région parisienne. Rev. Path. Veg. 11: 196-204. July-Sept. 1924.

Freeman, E. M., and L. W. Melander. Simultaneous surveys for stem rust: A method of locating sources of inoculum. Phytopath. 14: 359-362. Aug. 1924.

Johnson, C. O. and C. W. Bower. A method of detecting mixtures in Kanred wheat seed. Jour. Amer. Soc. Agron. 16: 467-470. 1924.

Tehon, L. R. and P. A. Young. Notes on the climatic condition influencing the 1923 epidemic of stem rust on wheat in Illinois. Phytopath. 14: 94-100. 1924.

Weiss, F. The effect of rust infection upon the water requirements of wheat. Jour. Agr. Res. 27: 107-118. 1924.

LEAF RUST CAUSED BY PUCCINIA TRITICINA ERIKSS.

As in the case of stem rust in the United States in 1924, leaf rust was inconspicuous and caused little damage. It was perhaps less prevalent than in any year since 1918, when it was very common in all states growing wheat. A report of the occurrence of leaf rust for 1924 by states is shown in Table 30. The highest percentage reported was 5% in Georgia, followed by 3% in North Carolina and Alabama, and 2.4% in Illinois. New York, Pennsylvania, South Carolina, Wisconsin, and Utah reported 1%. Michigan and Vermont, each, reported 0.5%, while Connecticut reported 0.25%. Mississippi and California reported no loss, while such other states as sent in reports indicated only a trace of injury. A further examination of the 1924 reports show that in every case there was "much less" or "less" leaf rust than in 1923, with the exception of Ohio which reported more.

It is interesting to note that in those regions where leaf rust was general, infection was too late to be of any importance. In Table 30 a summary has been made, using as a basis the reports sent in by various states over a period of years from 1918 to 1924, inclusive. The various sections of the United States in which wheat is a major crop are included in this table. The maximum and minimum amounts of rust reported by any state for the various areas are given, together with the average. Attention should be called to the fact that the records for 1918 are undoubtedly low for the entire country. At that time most pathologists regarded damage due to leaf rust of wheat as virtually negligible. A review of the reports on conditions in 1918 shows plainly that considerable damage occurred in various states, but most pathologists were probably too conservative in their estimates of loss. The years 1918, 1919, 1921, and 1922 were unquestionably years when considerable injury resulted and the estimates bear this out, with the exception of those recorded for 1918. The infection in 1924 was extremely light for the country as a whole and only in a very few cases was there an appreciable injury.

Comments by collaborators:

Tennessee: On June 5 I stopped at Knoxville and found no leaf rust in the wheat plots there, the varieties being past flowering at that time. Professor Essary tells me that this is the first year since he has been there in which there has been so little leaf rust of wheat. (Mains, Indiana)

Georgia: About May 6 I made a trip into Georgia stopping at Experiment and Tifton. At Tifton quite a fair amount of rust was found, one variety showing about 100 percent rusting. Most varieties, however, were only moderately rusted upon the lower leaves. At Tifton the wheat was in the milk stage. At Experiment, Georgia, the early varieties were just beginning to flower and there was only a small amount of rust on the lower leaves. On June 5, I returned to Experiment, Georgia, and found quite a fair amount of rust in the variety nursery, enough so that we are able to obtain data as to varietal susceptibility. The leaf rust, however, was not widespread and even in the Agronomy nursery there, many of the hybrids showed but little rust. (Mains, Indiana)

Indiana: Leaf rust is the least in 1924 that has occurred in six years. Fall wheat badly infected on October 31, especially near volunteer wheat. (Mains)

Minnesota: Light to moderate infections were reported throughout the wheat growing region. There was a marked variation in the amount of rust in neighboring fields, some were almost free from rust, others contained a moderate infection. (Sect. Pl. Path.)

Kansas: The least amount of leaf rust that has occurred in ten years. Practically none was to be found in the hard winter wheat area of the state. Only a very slight infection was found in the eastern soft wheat district, the infection being confined to the lowermost foliage. (Melchers)

Table 30. Summary of percentages of loss from leaf rust of wheat, 1918-1924.

Region	*1918	1919	1920	1921	1922	1923	1924
1. New England States	0 to t (Av. t)?	.5 to 5 (Av. 1)	0 to t (Av. t)	0 to t (Av. t)	0 to t (Av. t)	0 to 1 (Av. t)	.25 to .5 (Av. .2)
2. Atlantic States (Virginia northward)	0 to t (Av. t)?	1 to 3 (Av. 1.6)	0 to t (Av. t)	t to 6 (Av. 2)	t to 4 (Av. 3)	.2 to 2 (Av. 1)	t to 1 (Av. .5)
3. Ohio Valley States	0 to t (Av. t)?	1 to 3 (Av. 1.7)	t to 1 (Av. .3)	t to 7 (Av. 2.7)	5 to 18 (Av. 11)	1 to 4 (Av. 2)	t to t (Av. t)
4. Great Lake States	0 to t (Av. t)?	1 (Av. 1)	0 to t (Av. t)	0 to t (Av. t)	.5 to 2 (Av. 1.1)	t to t (Av. t)	t to 1 (Av. .5)
5. Great Plains States	0 to t (Av. t)?	.1 to 4 (Av. 1.5)	t to 1.5 (Av. .3)	t to 10 (Av. 2)	t to 5 (Av. .5)	1 to 1 (Av. 1)	t to t (Av. t)
6. Cotton Belt States	0 to t (Av. t)?	4 to 8 (Av. 5.3)	t to 4 (Av. 2)	t to 20 (Av. 7)	1 to 15 (Av. 6)	1 to 5 (Av. 3)	to to 5 (Av. .7)

States included in region:

1 = Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island.
2 = Virginia, New Jersey, Pennsylvania, Delaware, Maryland, New York.
3 = Ohio, Indiana, Kentucky, West Virginia.
4 = Michigan, Wisconsin, Minnesota.
5 = North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, Texas, Montana, Wyoming, Colorado, New Mexico.
6 = North Carolina, South Carolina, Georgia, Alabama, Tennessee, Mississippi, Louisiana, Oklahoma, Arkansas, Texas.

*See text (p. 125) for explanation.

Wheat - Leaf rust

Weather relations:

There undoubtedly was considerable fall infection in various states, but this seemed to have been killed out in some instances. This naturally held early spring infection in check to a considerable extent. Decidedly low temperatures occurred in January in several states and probably operated in eliminating sources of infection, while the late spring seemed unfavorable to the spread of leaf rust from such as may have survived. It is interesting to note that many states had more rainfall than usual in the spring months accompanied by a lower average temperature, while other states had less than usual with lower temperatures. These opposite conditions as regards rainfall did not seem to change the leaf rust situation. Where infection was found early in the season it was noted that the rust developed much more slowly than generally is the case. Undoubtedly the temperature relationships were the most important factors involved.

Arkansas: Unusually wet and cool weather in early spring hindered the development of leaf rust. (Dept. Pl. Path.)

North Dakota: Too cool for early development. Even the most susceptible varieties were little affected. (Weniger)

Kansas: Extremely dry weather during April and May is probably responsible for the non-occurrence of leaf rust. This is is the first year since 1917 that this condition has existed. For the first time I have had great difficulty producing an artificial epidemic in my leaf rust nursery here at Manhattan. (Johnston)

Pennsylvania: The warm winter with its alternate thawing and freezing seemed to more completely kill out leaf rust than ever before observed. The examination of many wheat fields in March and April showed no signs of this rust. (Kirby)

Leaf rust on Aegilops cylindrica:

This grass was found by C. O. Johnston in Kansas the past season to be causing considerable alarm on account of its occurrence in wheat fields in the southern part of the hard winter wheat belt. He reports it susceptible to *Puccinia triticina* Erikss. and states that "Natural hybrids of *Aegilops cylindrica* X wheat were found to be extremely susceptible to *Puccinia triticina* Erikss."

Varietal resistance:

The report from Colorado indicates that there are strains of leaf rust in that state different from those in neighboring states.

Illinois: As usual, Turkey wheats are much less severely rusted than the soft wheats. So far as could be observed, there was no appreciable difference in the amount of infection on the soft wheats such as Fultz, Fulcaster, Red Cross, Columbia, etc. (Tehon)

Texas: A uniform but not extremely heavy epidemic of leaf rust was found at Denton, Texas. A slightly heavier infection occurred at Temple, Texas. At both of these stations a number of pure lines of Mediterranean showed marked resistance to leaf rust. (Johnston, Kansas)

Colorado: Marquis moderately susceptible. Kanred and Turkey Red susceptible. (Learn)

FUSARIUM BLIGHT (SCAB) CAUSED BY GIBBERELLA SAUBINETII (MONT.) SACC.

Wheat scab is confined generally to the section of the country east of the Great Plains area, being most prevalent in the corn belt. Records indicate that scab was about as prevalent in 1924 as in 1923, being perhaps an average year for this disease and certainly not to be compared with the season of 1919, which was an outstanding one for damage caused by wheat scab.

Table 31. Estimated percentage reduction in yield of wheat due to Fusarium blight (scab) 1924.

Percent	States
5	Pennsylvania, Iowa, Tennessee
2	Delaware, Illinois, Ohio
1.5	Maryland
1	Virginia, North Carolina, Michigan, Wisconsin, North Dakota, New Mexico
.5	New Jersey, Indiana, Kentucky
trace	New York, West Virginia, Texas, Kansas
no loss	South Dakota, Mississippi, Idaho, Washington

Table 32. Maximum percentages of scab infection noted by collaborators, 1924.

Percentage	State	Percentage	State
100	Illinois	10	Minnesota (durum wheat)
90	Maryland		
80	Pennsylvania	7	Virginia
77	Delaware	5	North Dakota
60	Ohio	2	Michigan
20	New Jersey, Iowa	trace	South Dakota, Kansas

Weather relations:

Pennsylvania: Considerable injury from scab. Wet weather at flowering time. (Kirby)

Wheat - Fusarium blight

Ohio: The unusually high precipitation of the early season, particularly when the wheat was heading out, presented conditions very favorable for the scab disease. (Thomas)

General statements by collaborators:

New Jersey: General over the state. Severe in Cumberland and Burlington Counties in fields of wheat following corn. (Martin & Haenseler)

Pennsylvania: Scab was much more severe in corn ground as for example in Lancaster County there was 72.8% scab when wheat followed corn and 8% when wheat followed other than cereal crops.

Scab this year appears to be more severe than for many years and the loss will likely run as high as 5 to 10%. The dates of occurrence, the amount of scab and the locations where scab has been observed in Pennsylvania are as follows: (Kirby)

Date observed	County	No. fields	% Scab
June 24	Lebanon	1	t
June 25	Berks	2	.5
June 26	Delaware	14	64.0
July 7	Chester	8	8.1
July 8-9	Lancaster	24	19.1
July 10	Cumberland	12	27.6
July 11-12	Blair	21	7.9
July 15	Center	6	30.0
July 16	Lycoming	9	26.1

Delaware: Exceptionally heavy infection. Appears more generally prevalent in the late maturing field of New Castle County. Farmers are generally complaining of poor development of heads. The development of straw is best secured for years. The following is a report on the prevalence of wheat scab in threshed wheat: (Adams)

1924

Total number samples (58) collected showed
New Castle County..........77%
Kent County................47%

1923

Total number of samples (6) collected
New Castle County..........27%
Kent County................33%
Sussex County..............--

Ohio: Very severe, in some cases running as high as 60% on corn ground wheat. The worst disease of wheat this year. (Hesler)

Repeated observations indicate that wheat scab may be expected to be much more severe where wheat follows corn. (Thomas)

Wheat - Fuarium blight

Illinois: Scab unusually bad this year. At Rochelle, one field had an average of 60% scab with most of 80% of the top heads destroyed. At Amboy, another field had an average of 40% of the heads scabby and most of 70% of the top heads destroyed. By top heads I mean those on the longest stalks. These two fields were Marquis wheat (?). Marquis fields have usually showed 5 to 10% or higher percent of scab. The blue stem or blue ribbon spring wheat, bearded, usually showed 1 to 5% and one case of 10% scab. (Young)

Michigan: Common in southern half of state. With certain varieties actual loss of 1 or 2% may occur. Peculiar blasting of entire plants, probably of this nature, has done considerable damage with some varieties.

Iowa: Common throughout Iowa causing moderate damage estimated at 5%. (Porter)

Recent literature:

Dickson, J. G., Sophia H. Eckerson and Karl P. Link. Studies on predisposition of wheat and corn to seedling blight caused by Gibberella saubinetii. (Abstract) Phytopath. 14: 34. 1924.

Hynes, H. J. On the occurrence in New South Wales of Gibberella saubinetii, the organism causing scab of wheat and other cereals. Jour. & Proc. Roy. Soc. New South Wales 57: 337-348. May 1924.

Johnson, A. G., H. H. McKinney and C. E. Leighty. The rosette disease of wheat and its control. U. S. Dept. Agr. Farm. Bul. 1414: 1-10. June 1924.

Koehler, B., J. G. Dickson and J. R. Holbert. Wheat scab and corn rootrot caused by Gibberella saubinetii in relation to crop successions. Jour. Agr. Res. 27: 861-880. Mar. 15, 1924.

Lundegordh, Henrik. Der Einfluss der Wasserstoffionenkonzentration in Gegenwart von Salzen auf das Wachstum von Gibberella saubinetii. Biochem. Zeitschr. 146: 564-572. Apr. 1924.

MacInnes, Jean and R. Fogelman. Wheat scab in Minnesota. Minnesota Agr. Exp. Sta. Tech. Bul. 18: 1923.

Russell, H. L. and F. B. Morrison. Studies on nature of disease resistance in cereals. (Data supplied by J. G. Dickson). In New facts in farm science. Wisconsin Agr. Exp. Sta. Bul. 362: 43-45. Mar. 1924.

Wineland, G. O. An ascigerous stage and synonomy for Fusarium moniliforme. Jour. Agr. Res. 28: 909-922. May 31, 1924.

ROSETTE (CAUSE UNDETERMINED)

No extensive reports for 1924 are available on this disease which seems to be restricted to Illinois and Indiana. The accompanying table compiled by McKinney and Dungan is of interest but does not give any indication of the extent of damage that rosette does when considering the entire wheat crop of these states. So far rosette would come in the class of minor wheat disease problems in this country.

Table 33. Distribution of the rosette disease in the United States (1919-1924)

State	County	Number of infested fields	Approximate acreage of infested fields
Illinois	Madison	27	670
	Mason	48	1310
	Sangamon	2	380
	Logan	1	20
	Cass	-	-
Indiana	La Porte	7	213
	Porter	6	120
	Tippecanoe	1	5

TAKE ALL CAUSED BY OPHIOBOLUS GRAMINIS SACC.

No new areas have been added during the past year to the list of states reporting take all of wheat. Table 34 gives the year when each state, in which Ophiobolus graminis is known to occur, first reported it.

Table 34. Years in which take all of wheat was reported authentically from various states.

Year	States
1919	Virginia, *Washington
1920	New York
1921	Indiana, Arkansas, Oregon
1922	Kansas
1923	California, Tennessee, Maryland (material collected in 1922), North Carolina

*Collected in 1919 but not determined until later.

An attempt has been made to ascertain the damage which this disease has caused in the states in which it has been reported during the several years of its occurrence. Table 35 shows the estimated percentage loss from this disease. It will be observed that New York is the only state which reports any appreciable loss. When these estimates are compared with those for losses caused by some of our footrot organisms such as Helminthosporium sativum, it would seem that the take all disease of wheat has up to the present caused no appreciable loss in the United States. While, of course, some doubt may exist at times as to the actual identity of the organism involved, these reports of the injuries caused by Ophiobolus seem to have been considered carefully.

Table 35. Estimated percentage loss from take all of wheat caused by Ophiobolus graminis from 1919-1924, according to reports of collaborators.

Year	Va.	Wash.	N. Y.	Md.	Ind.	Ark.	Ore.	Kans.	Calif.	Tenn.	N. C.
1919	P	P									
1920	0	0	P	t							
1921	0	0	.5	t	P	P	t				
1922	0	0	1.0	t	0	t	t	t			
1923	0	0	.08	t	0	P	t	P	t	P	
1924	0	0	t	t	0	P	t	P	t	P	.05

t = trace
P = Known to occur but no evidence that it caused any appreciable loss of the state wheat crop.

Control measures:

The Department of Agriculture of South Australia (1) recommends the following measures for the control of take all: Burn stubble early. Fallow early, and keep clean by cultivation, which also makes a better seedbed. Roll if seedbed is not well compacted. Use more superphosphates; consider taking grasslands out of the rotation in bad take all areas; use wheat-oats-bare fallow, or wheat-oats-oats-bare fallow. Sow early wheats if it is thought that the soil is still infested.

Bartlett (2) also states that crop rotation is successful in controlling the disease.

An article (3) dealing with the rate of spread of a footrot of wheat, the cause of which is not given but which resembles take all, has been published recently. Methods of seed bed preparation and their effect on the control of this footrot for the conditions prevailing in Kansas are discussed. It is shown that the date and depth of plowing have a marked influence on the survival of this disease.

Recent literature:

Cited:

1. Anon. "Take all" investigations. Jour. Dept. Agr. South Australia 27: 566-570. Jan. 15, 1924.
2. Bartlett, H. The control of take all and footrot in wheat. Agr. Gaz. New South Wales 35: 82. 1924.
3. Sewell, M. C., and L. E. Melchers. The effect of rotation and tillage on footrot of wheat in Kansas, 1920-1924. Jour. Amer. Soc. Agron. 16: 768-771. Dec. 1924.

Not cited:

Bellanger, Fernand. La maladie du pied des cereales. Terre Vaud. 16: 350-351. May 31, 1924.

Fraser, W. P. "Take all" of wheat in Western Canada. (Abstract) Phytopath. 14: 347. July 1924. (Saskatchewan; perithecia with mature asci found.)

Putterill, V. A. Plant diseases in the western Cape province. Vrotpootjie or take all of wheat. Jour. Dept. Agr. South Africa 8: 602-612. June 1924.

Samuel, G. Take all investigations. Jour. Dept. Agr. South Australia 27: 1134-1147. July 1924.

Sevegrand, P. Le piétin des céreales. Vie. Agr. et Rur. 24: 341-342. May 31, 1924.

FOOTROT CAUSED BY HELMINTHOSPORIUM SATIVUM PAM., KING, & BAK.

Helminthosporium footrot has been reported as causing appreciable damage in several states. Undoubtedly as studies progress this organism will be found responsible for causing a definite footrot in not only the hard spring wheat area, but also in the soft and hard winter wheat regions.

This fungus has been shown to be capable of attacking all parts of the wheat plant, affecting the seedling stage in which the plants may be killed outright, or later stages in which older plants are killed with evident root or footrot symptoms. The common name Helminthosporium footrot is being used to distinguish this disease from other footrots.

Table 36. Estimated percentage reduction in yield of wheat due to Helminthosporium footrot, 1924.

Percentage	State
10	North Dakota
8	Minnesota (durum)
4	Minnesota (common wheat)
2	South Dakota, Kansas
.5	Pennsylvania
trace	New York

Comments by collaborators:

Utah: Footrot occurs in the state, however, it is not known at present to be due to Helminthosporium. (Richards)

South Dakota: Worst area along northern part of state. Some fields were 100% loss. My estimate, 2%, is probably too low. (Evans)

North Dakota: Epidemic. Ten percent reduction for the state. Very severe in durum, Marquis and Kota. (Weniger)

Minnesota: Eight percent reduction in yield in durum wheat. Four percent for common wheat. Durum varieties very susceptible. As high as 75% of plants killed in some fields (after heading). Disease most severe late in the season. (Sect. Pl. Path.)

Kansas: Helminthosporium injury occurs in many fields. It is more common than at first thought in the hard wheat area. Rotation and time and depth ofplowing seems to have an important bearing on its control. (Melchers)

Pennsylvania: Forward at least was more severely attacked than any other variety. (Orton & Kirby)

Recent literature:

Christensen, J. J. and E. C. Stakman. Foot and rootrots of wheat in 1924. (Abstract) Phytopath. 15: 15. 1925.

Henry, A. W. Rootrots of wheat. Minnesota Agr. Exp. Sta. Techn. Bul. 22: 1-71. Apr. 1924.

Hynes, H. J. Investigations by the late C. O. Hamblin into the Helminthosporium disease of wheat. Jour. & Proc. Roy. Soc. New South Wales 57: 160-172. May 1924.

McKinney, H. H. An undescribed imperfect fungus associated with wheat footrot in Oklahoma. (Abstract) Phytopath. 14: 34. 1924.

OTHER FOOTROT AND ROOTROT DISEASES OF WHEAT

There are undoubtedly several other organisms involved in the production of foot and rootrot diseases of wheat in the United States. The only records available of such reports for 1924 are the following statements by collaborators.

Minnesota: Fusarium sp. seems to be partially responsible for rootrot damages in spring wheat. Many fields of durum had 5 to 30% of the plants killed after heading. Durum most susceptible to footrot caused by Fusarium sp. Several Fusaria have been isolated from a large number of fields but Helminthosporium seems to predominate. (Sect. Pl. Path.)

Kansas: Species of Fusaria have been isolated very frequently. A fairly large percentage of Wojnowicia graminis has been isolated from plants in conjunction with Helminthosporium sativum. (Melchers)

Brittlebank and Adam (1) report the occurrence in Australia of a new disease resembling the true take all caused by Ophiobolus but due to a different organism to which they give the name Pleosphaeria semeniperda. The fungus has been found on wheat, oats, Avena fatua and Bromus sterilis. The conidial stage is believed to be identical with Podosporiella verticillata O'Gara, described as the cause of a seedling disease of wheat in Utah in 1915 (Phytopath. 5: 323. 1915)

Recent literature:

Cited:

1. Brittlebank, C. C., and D. B. Adam. A new disease of the Gramineae: Pleosphaeria semeniperda nov. sp. Trans. British Mycol. Soc. 10: 123-127. Sept. 1924.

Not cited:

Henry, A. W. Rootrots of wheat. Minnesota Agr. Exp. Sta. Techn. Bul. 22: 1-71. Apr. 1924.

ERGOT CAUSED BY CLAVICEPS PURPUREA (FR.) TUL.

Ergot of wheat occurs in various states, especially on durum wheat. Collaborators' reports for 1924 are as follows:

Ohio: One case of its occurrence reported. (Young)

Illinois: Ergot for the first time occurred in a five acre field in Carroll County. Only two sclerotia were found. (Tehon)

Michigan: Occasionally found. (Coons)

Minnesota: A trace occurred in Hennepin County. (Sect. Pl. Path.)

North Dakota: A trace occurred. Not sufficient moisture for development. Too cool at the period of infection at blossoming time. The last epidemic occurred in 1921, when many lots of amber durum contained 10% or more of sclerotia. (Weniger)

STRIPE RUST CAUSED BY PUCCINIA GLUMARUM (SCHM.) ERIKS. & HENN.

The only report of the occurrence of stripe rust in 1924 was from Idaho, where it was of no importance according to Hungerford.

Recent literature:

Akerman, A. Sommarens gulrostangrepp pa vetet (Attacks of yellow rust upon wheat during the summer) Sver. Utsädesför. Tidsskr. 33: 262-267. 1923.

Humphrey, H. B., C. W. Hungerford, and A. G. Johnson. Stripe rust (Puccinia glumarum) of cereals and grasses in the United States. Jour. Agr. Res. 29: 209-227. Sept. 1, 1924.

ANTHRACNOSE CAUSED BY COLLETOTRICHUM GRAMINCOLUM (CES.) WIL.

This disease seems to be confined to a section of the country east of the Great Plains area. It does not seem to be of any importance in the main winter wheat belt. Losses reported were 4% in Ohio, 3% in Pennsylvania, 2% in Iowa and a trace in New York and Wisconsin.

Illinois: There has been practically no anthracnose of wheat this season. It was found only once in very moderate amounts in one field in Knox County. (Tehon)

Indiana: Severe on lowlands in Jackson County. Observed growing on early fall sown wheat. (Mains)

POWDERY MILDEW CAUSED BY ERYSIPHE GRAMINIS DC.

Powdery mildew of wheat seems to have been most prevalent in the northeastern part of the United States in 1924. Those states reporting a trace were New York, New Jersey, Virginia, Illinois, Wisconsin, Maryland and Minnesota. Pennsylvania reported a 2% loss.

Pennsylvania: This disease was the most severe in many years, being present on nearly 100% of all plants observed about jointing time. It was first observed on April 17 at East Greenville, Montgomery County. Since then it has been observed everywhere in the state. By the time the wheat entered the dough stage little or no mildew could be found, however, it must have caused 2 to 5% loss in the state this year. (Kirby)

Illinois: This disease is occurring in the northeastern corner of the state. It is more abundant and more prevalent in Illinois this season than ever before. Hitherto it had been found only in Madison County but this season it has been found in Cass County where 20% of the plants in a 40 acre field of Turkey Red were infected, in DuPage County where 100% of the plants in one-sixth acre plots of Red Cross and Turkey 10-110 were diseased, and in Lake County where a slight infection was in a 20 acre field of Turkey Red. (Tehon)

Utah: Abundant in irrigated districts and occasionally destructive. (Richards)

New Jersey was the only state reporting on varietal reaction to powdery mildew. Prelude was severely attacked, Java was heavily infected and Red Bobs slightly, and on Marquis and Kota there was only a trace, according to the Department of Plant Pathology.

BLACKPOINT CAUSED BY HELMINTHOSPORIUM SATIVUM PAM., KING, & BAK.

The only state reporting this disease was North Dakota.

North Dakota: It caused a loss of 0.5%. It was less severe than usual. Most severe on Red Durum, Monad, and Kubanka. Weather conditions not as favorable for injury to heads and kernels as it was to earlier rootrot and bladeblotch by same organism. (Weniger)

GLUMEBLOTCH CAUSED BY SEPTORIA NODORUM BERK.

Glumeblotch is general but most prevalent in the South and the Ohio Valley States. The injury which this disease causes has varied from year to year. Some collaborators seem to question the importance of Septoria. The writer has seen instances when it was unquestionably responsible for a slight shriveling of the grain. It has been observed that an abundance of rainfall and moderately high temperatures are necessary at the time the wheat heads emerge from the "boot" if injury is to result.

In 1924 Pennsylvania and Arkansas reported losses of 1%, New York and Wisconsin each a trace, and Iowa and Kansas reported that it was present but caused no loss.

It is undoubtedly true that glumeblotch has been confused with the two bacterial diseases, blackchaff and basal glumerot, and that errors have been made in the reports in past years. It would be desirable to submit specimens to the Bureau of Plant Industry for careful examination when there is any doubt concerning the organism.

Pennsylvania: Blotch is only slightly more prevalent than in the past year or two. The disease was first observed on June 24 at Lebanon and during the remainder of the surveys it was observed than average of 8-15% of the spike lots were infected. Velvet Chaff most susceptible. (Kirby)

Virginia: Septoria is prevalent in the wheat. Roguing of the wheat varieties for chaff color has been impossible because of Septoria. The infected spikes appear to have ripened prematurely, the kernels being poorly developed. As the infection often amounts to five percent or more, it is expected that the quality as well as the quantity of the grain will be poor. (Cereal Courier 16: 139. July 10, 1924.)

Wisconsin: Glumeblotch is general over the state but of minor importance. (Vaughan)

BLACKCHAFF CAUSED BY BACTERIUM TRANSLUCENS UNDULOSUM S. J. & R.

For the most part, blackchaff occurred in recent years most extensively in the Mississippi Valley, Great Plains Area, Montana and Idaho. It has been most conspicuous in the Great Plains area and Mississippi Valley. It was not serious in 1924.

Blackchaff disease has been confused frequently by pathologists with the basal glumerot and glumeblotch diseases and there undoubtedly have been some errors in reports that have been submitted. Also, it might be mentioned that a variety of wheat known as Clark's Black Hull under certain environmental conditions produces a blackening of the glumes which has been confused with the bacterial blackchaff disease.

Minnesota: Very generally present. Kota and Ruby hybrids are very susceptible. Khapli, especially on peat lands, was found heavily infected on leaves, stems and glumes. (Dept. Pl. Path.)

Wheat - Speckled leafblotch

North Dakota: More abundant on Kota and Marquis hybrids than either Kota or Marquis this year. Last year Kota very susceptible. (Weniger)

Nebraska: More prevalent than in previous years. All fields show considerable infection, from 1 to 25%. Particularly common where wheat had made a rank growth and where lodging occurred. Not causing any shrinking of the kernels. (Goss)

Kansas: The season of 1924 was not favorable for blackchaff infection and spread. In order to have an epidemic of this disease it is necessary to have an excessive amount of moisture almost continuously from the time the wheat heads emerge from the "boot" until the dough-stage is reached. Moderately high temperatures are favorable for the rapid spread and development since it has been observed that low temperatures (45 to 60° F) are very much less favorable. The environmental conditions at heading time are those which determine how much damage may occur. Even though there is heavy infection on the foliage, culms, and glumes little or no damage will result if bright, warm, dry weather prevails from the milk stage of the wheat kernel until harvest. (Melchers)

Iowa: General over state, but causing very little noticeable damage. (Porter)

SPECKLED LEAFBLOTCH CAUSED BY SEPTORIA TRITICI DESM.

Speckled leafblotch is general in its occurrence and has been found in past years to be widely distributed. If any one is prepared to state how much injury the wheat plant sustains when the foliage ceases to function, an approximation may be made of the damage caused by this Septoria. In several instances from one-fourth to one-half of the foliage has been dried up from an attack of speckled leafspot on wheat in Kansas. No attempt, however, has been made to interpret this in loss estimates.

The following states have reported a trace of loss in 1924: New York, Pennsylvania, South Carolina, Wisconsin and Idaho. Illinois reports .75%, Arkansas 2% and Alabama 1%.

Several other reports have been sent in of Septoria sp. on foliage from Connecticut, Idaho and Washington.

Comments by collaborators:

Illinois: Second only to wheat rust in conspicuousness. This disease has appeared in all parts of the state. In more than usual abundance on Fultz, Columbia, and a variety reported as "Orange." The resistance shown by Red Cross is more marked this season than usual. Turkey wheats have been uniformly highly infected. (Tehon)

Kansas: Practically no evidence of Septoria was noted the past year in direct contrast to other seasons. (Melchers)

WHEAT NEMATODE CAUSED BY TYLENCHUS TRITICI (STEIN.) BAST.

This disease up to 1924 had only been reported from Virginia, West Virginia, North Carolina, Georgia and California. Since 1922 it does not seem to have caused any appreciable damage in the states where it is known to occur. Only a few very slight infestations were reported in 1923 by the above states.

The most important development in the wheat nematode situation in 1924 was the discovery of the nematode disease occurring in Oconee County, South Carolina, which lies about midway between the Georgia and North Carolina infestations. The disease was found in four fields in the county where it affected the following percentages of plants in the various fields: 80%, 50 to 75%, 1.5%, and less than 1%. The disease has probably been prevalent in the county for several years.

Another interesting occurrence was that in Arizona where it was found for the first time. It was observed by W. H. Tisdale, April 26, at Sacaton in experimental plots in a single row of wheat introduced from India.

Recent literature:

Leukel, R. W. Investigations on the nematode disease of cereals caused by Tylenchus tritici. Jour. Agr. Res. 27: 925-956. Mar. 22, 1924.

FLAGSMUT CAUSED BY UROCYSTIS TRITICI KOERN.

Up to 1924 flagsmut of wheat has been reported from Illinois, Missouri, and Kansas. Complete accounts of the occurrence, spread of this disease, economic importance and additional information is to be found in the Plant Disease Bulletin sections on Diseases of Cereal and Forage Crops in the United States for 1921, 1922 and 1923.

Reports by collaborators:

Illinois: Flagsmut was found in one field in the eastern part of Washington County about thirty miles from the nearest known infestation. The maximum found in any field was 50%, this field being protected from the cold by timber. Attack light where wheat winterkilled. (P. A. Glenn)

Kansas: This disease occurred in Leavenworth County, northeastern Kansas the same as last year. Although the percentages in various fields were somewhat lower than in 1923, flagsmut was located in many new fields. The amount of smut varied from a trace to approximately 10%. It has been confined to Harvest Queen. (Melchers)

Recent literature:

Carne, W. M. Flagsmut of wheat (Urocystis tritici). Jour. Dept. Agr. Western Australian II, 1: 142-147. June 1924.

Griffiths, Marion A. Experiments with flagsmut of wheat and the causal fungus, Urocystis tritici Koke. Jour. Agr. Res. 27: 425-450. Feb. 16, 1924.

Noble, R. J. Studies on the parasitism of Urocystis tritici Koern., the organism causing flagsmut of wheat. Jour. Agr. Res. 27: 451-490. Feb. 16, 1924.

Shelton, J. P. Breeding wheats resistant to flagsmut. Agr. Gaz. New South Wales 35: 336-338. May 1924.

OTHER DISEASES AND INJURIES

Bacterium atrofaciens McC., basal glumerot, has been reported in past years from states between the Mississippi River and the Rocky Mountains, Michigan, New York. It has never occurred in amounts sufficient to cause appreciable damage. In 1924 this disease was found on several varieties in the University Farm plots at St. Paul, Minnesota, July 15 to 24, and Kirby reported that in Pennsylvania it was very common. "There was apparently from 1/2 to 2% of the heads infected in most of the fields in the following counties: Chester, Lancaster, Cumberland, Blair, Center, Lycoming, Clinton, and Erie."

Blast (cause unknown). Slight injury was reported from Arkansas. The disease was apparently associated with weather conditions. Some heads blight partially. The upper spikelets are often normal; the lower ones missing. In Illinois it was observed that the top half of heads failed to set grain, a condition only found in Carroll County, and not hitherto seen in the state.

Epicoccum (vulgare Corda)?, glume smudge, Pennsylvania.

Hormodendrum cladosporioides Sacc., sooty mold, Mackie of California says, "It reduced wheat yields adjacent to the coast, as usual. This disease is the limiting factor in wheat production in the lower Salinas Valley and northward. We found no varietal resistance although we have observed hundreds of varieties under attack. It does not attack barley and oats seriously."

Marasmius tritici P. A. Young (4) has been found in Illinois. Plants attacked are stunted and killed. Sporophores of the fungus occur on the basal internodes. This is the first report of this trouble.

Pythium debaryanum Hesse, seedling blight, Washington.

Sclerospora macrospora Sacc., downy mildew, was less abundant in Delaware than in 1923 and caused no damage. It occurred on Dietz Amber and Blue Stem varieties in the plots at the farm. (Adams)

Stripe (cause undetermined). In Pennsylvania a stripe disease, identical with that reported in previous years from New York, was found on Red Rock wheat, and caused a loss of 1%. This is the first time it has been found in the state. A stripe disease is also reported from Illinois by Tehon, as follows:

> In the wheat fields of southern Illinois, and to a lesser extent in northern Illinois, there has appeared this season an unusual and remarkable pathological condition among the plants which is the best described by the term "stripe." It is largely confined to soft, beardless varieties such as Fultz and Red Cross. Beginning near the top of the sheath, stripes of dead, yellowish-brown tissue run the length of the leaf, expanding near the tip

and causing the death of the tip for 2 or 3 cm. The stripes vary in width according as they involve the tissue adjacent to only a few, or to many, of the veins. At times the entire linear half of a leaf may be involved, but the stripes rarely appear to involve or cross over the strong middle vein. Running parallel to the diseased stripes is the normal, healty, green tissue. So definite are the tans and yellow-brownsof the diseased tissue that they form, beside the healthy tissue, a contrast equaled in brilliany only in the stripe disease of barley. The most careful microscopic examinations have failed to reveal the presence of any fungus, or other organism capable of causing the disease. It seems entirely probable that the condition of the leaves is due to the unusual climatological sequence of our spring.

"Following an excellent start under favorable conditions in April, the growth of the wheat was held in check through May by the coldest weather recorded for years, but during June which, while tremendously stimulating the growth of the crop,has imposed a decided strain on the adaptive powers of the plants, resulting in the death of tissues unable to secure sufficient water for evaporation during the hot days. "Stripe," first seen June 5 in Green County, has been found generally prevalent on wheat in Jersey, Calhoun, Green, Madison, Randolph, Monroe, St. Clair, White and Jackson Counties. Farther north, in Moultrie, Piatt, Kankakee and Will Counties, it is less prevalent."

Recent literature:

1. Foëx, E. Note sur Erysiphe graminis DC. Bul. Soc. Mycol. France 40: 166-176. Sept. 1924.
2. Newton, R. The nature and practical measurement of frost resistance in winter wheat. Res. Bul. Univ. Alberta Coll. Agr. 1: 1-53. July 1924.
3. Tehon, L. R. Marasmius on wheat. Mycologia 16: 132-133. 1924.
4. Young, P. A. A Marasmius parasitic on small grains in Illinois. Phytopath. 15: 115-118. Feb. 1925.

RYE

STEM RUST CAUSED BY PUCCINIA GRAMINIS PERS.

Stem rust of rye was less widely distributed and caused less damage to the crop in 1924 than for several years. In 1921 there was considerable stem rust reported on rye. In 1922 and 1923 there was considerably less than in 1921. It is evident that stem rust was of even less importance in 1924 than in the last two years and, as with the stem rusts of other cereals, was an insignificant factor in lowering the yield.

Table 37. Percentages of loss from stem rust of rye, 1924, as reported by collaborators.

Percentage	States
1	Michigan, Ohio, South Dakota
.25	Connecticut
t	New York, Pennsylvania, Maryland, Illinois, Arkansas, Wisconsin, Minnesota, North Dakota, Alabama, Iowa, Idaho, Washington

States where stem rust of rye occurred but where no estimate on loss was made were: Connecticut, Pennsylvania, Texas, Arkansas, Indiana, Iowa, Idaho, Nebraska, Colorado, Wyoming, and Montana.

Dry and moderately cool conditions prevailed in Kansas, Nebraska and Iowa which probably held stem rust in check. Vaughan reported that in Wisconsin it was too cold for rust to get started.

LEAF RUST CAUSED BY PUCCINIA DISPERSA ERIKS.

Leaf rust was somewhat more common and apparently more destructive the past year than in 1923, judging from the estimates submitted by collaborators.

Table 38. Estimated percentage loss from leaf rust of rye, 1924, as reported by collaborators.

Estimated percent loss	States
3	Ohio
2	New Jersey
1.5	Connecticut
1	New York, Georgia, Maryland
.5	Pennsylvania, Illinois
t	Delaware, Virginia, Michigan, Wisconsin, Iowa, Arkansas, Kansas, Louisiana, Mississippi, Kentucky
0	North Dakota, South Dakota, Idaho, Washington, Oregon

New Jersey: General over state. Severe in South Jersey. (Dept. Pl. Path.)

Pennsylvania: General where rye was grown. (Kirby)

Georgia: Throughout southern counties. (Boyd)

Arkansas: Cold winter and spring reduced the percentage very materially. (Dept. Pl. Path.)

Minnesota: Overwintered in mycelial stage. Reported April 30 on old leaves. First observed on new leaves May 17. The distribution of leaf rust of rye very irregular. Some fields were found to be almost free, others were fairly heavily infected. (Sect. Pl. Path.)

Wisconsin: Reduced tillering in fall. (Vaughan)

Indiana: Prevalent only just previous to maturity. (Mains)

Recent literature:

Mains, E. B. Rye resistant to leaf rust, stem rust, and powdery mildew. (Abstract) Phytopath. 15: 58-59. Jan. 1925.

Mains, E. B., and H. S. Jackson. Aecial stages of the leaf rusts of rye, Puccinia dispersa Eriks. and Henn., and of barley, P. anomala Rostr., in the United States. Jour. Agr. Res. 28: 1119-1126. June 14, 1924.

ERGOT CAUSED BY CLAVICEPS PURPUREA (FR.) TUL.

This disease did not occur in serious amounts in the states where rye is a major crop. It was very much less common in North Dakota than reported in other years.

Table 39. Losses due to ergot of rye, as estimated by collaborators, 1924.

Percentage	States
5	Ohio
4	Iowa
2	Michigan, South Dakota
1	Illinois
.5	North Dakota, Kentucky
t	New York, New Jersey, Virginia, Wisconsin, Utah, Idaho
0	Pennsylvania, Kansas, Mississippi, Washington, California

Statements by collaborators:

Iowa: General in northern Iowa. Severe in many fields. (Porter)

North Dakota: Last epidemic of ergot in 1921. This year it was not abundant. Common on volunteer rye. (Weniger)

South Dakota: Ergot was very common this year, some fields bad; others with only small amounts. (Evans)

Recent literature:

Weniger, Wanda. Ergot and its control. North Dakota Agr. Exp. Sta. Bul. 176: 1-23. 1924.

ANTHRACNOSE CAUSED BY COLLETOTRICHUM GRAMINICOLUM (CES.) WILS.

Anthracnose has been reported generally east of the 100th meridian. In 1924, according to reports, it was somewhat more destructive than in 1923, and strikingly more so than during the past several years. Two states, Mississippi and Alabama, report a loss of 10%. In Alabama as much as 80% infection occurred in a field.

Table 40. Summary of the percentage of loss from anthracnose 1924.

Percentage	States
10	Mississippi, Alabama
5	Pennsylvania
1.5	Wisconsin
1	New York
.5	Indiana, Illinois
t	New Jersey

Statements by collaborators:

Illinois: There has been a single instance of anthracnose on rye reported. About 90% of the plants in a 5 acre field in Knox County were diseased, but the injury appears to have been very slight. (Tehon)

Mississippi: As much as 85% of the plants attacked. Kills stalks at crown. Head and leaf blight. (Barker)

POWDERY MILDEW CAUSED BY ERYSIPHE GRAMINIS DC.

There appeared to be somewhat less powdery mildew on rye than in 1923. The following states reported its occurrence: Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Indiana, Illinois, Wisconsin, and Iowa. The only state reporting an appreciable injury was Pennsylvania, where 0.5% loss occurred.

Recent literature:

Mains, E. B. Rye resistant to leaf rust, stem rust, and powdery mildew. (Abstract) Phytopath. 15: 58-59. Jan. 1925.

SCAB CAUSED BY GIBBERELLA SAUBINETII (MONT.) SACC.

Very slight amounts of scab occurred on rye in 1924. The only noteworthy case was in Wisconsin where Vaughan reports: "2% loss; considerable in shocks." Slight amounts were observed in some fields in New York, Pennsylvania, Illinois, Iowa, and North Dakota.

STEM SMUT CAUSED BY UROCYSTIS OCCULTA (WALLR.) RAB.

Prior to 1924, stem smut had been reported only east of the 100th meridian. In 1924, however, Hungerford reported it as occurring for the first time in Idaho. In general the losses were slight or very small in the states where it occurred. The largest estimated loss, 0.5%, was reported from Pennsylvania. Illinois reported .24%. Traces were reported from New York, Wisconsin, Minnesota, Iowa, and North Dakota.

Pennsylvania: About 20% infection was observed in untreated plots. (Kirby)

Illinois: Unusually abundant. There have been several cases of severe damage some running as high as 15 and 20%. It appears to be more abundant in the northern half of the state. (Tehon)

Minnesota: First report June 3 from Carver County. Quite generally present throughout the rye-growing region but considerably less severe than last year. (Sect. Pl. Path.)

North Dakota: From a trace to one percent has been found in plats at Fargo. The disease has not been common with us in past years. The amount indicated is more than observed for the past five years at Fargo. (Weniger)

Idaho: Found for the first time near Sandpoint. (Hungerford)

LOOSE SMUT CAUSED BY USTILAGO TRITICI (PERS.) ROSTR.

Loose smut was not reported in 1924. Up to the present this smut has been reported from the following states: New York, Virginia, Tennessee, Indiana, Illinois, Missouri, Oklahoma, Minnesota, North Dakota, and Kentucky.

OTHER DISEASES

Bacterium translucens secalis Reddy, Godkin, & Johnson (2) was described as causing a bacterial blight of rye. The new variety was found in 1921 at Bloomington, Illinois. Subsequent experimentation has shown that it affects rye only, whereas B. translucens attacks only barley, and B. translucens undulosum occurs on wheat, barley, rye, and spelt. In 1924 Mains reported that B. translucens secalis was noted at La Fayette, Indiana, by A. G. Johnson.

Rye - Other diseases

Helminthosporium sativum Pam., King, & Bak., causing leafspot, was reported from North Dakota, Delaware, New York, and Pennsylvania.

Marasmius tritici P. A. Young was reported for the first time from Illinois. According to Tehon this fungus attacks the lower internodes killing the plants.

Rhynchosporium secalis (Oud.) Davis, causing leafblight, was prevalent on the lower leaves in Wisconsin. (Vaughan)

Septoria secalis Prill. & Delacr., leafblotch, was reported from Indiana and Illinois.

Recent literature:

1. De Jaczewski, A. Sur le développement menacant du Tilletia secalis Kühn en Russie pendant les dernieres années. (On the threatening spread of Tilletia secalis Kuhn in Russia during recent years. Rept. Intern. Conf. Phytopath. & Econ. Entom., Holland 1923: 267-272. 1923.
2. Reddy, C. S., James Godkin, and A. G. Johnson. Bacterial blight of rye. Jour. Agr. Res. 28: 1039-1040. June 7, 1924.

BARLEY

STEM RUST CAUSED BY PUCCINIA GRAMINIS PERS.

This disease was about as prevalent as the stem rust of rye and generally speaking the estimated loss was nearly the same.

Table 41. Percentage losses from stem rust of barley, as estimated by collaborators, 1924.

Percentage loss	States
2	South Dakota
1	New York, Missouri, North Dakota, Texas, Iowa
.5	Ohio, Wisconsin
.25	Connecticut
t	Pennsylvania, Virginia, Michigan, New Mexico, Washington, Utah, Idaho
0	Kentucky, California, Nebraska, Colorado, Wyoming, Montana

Wisconsin: Found only on late-sown barley. In that case practically ruined. (Vaughan)

Illinois: Barley and fox-tail rusted on June 10th and on June 15th in Kane County near the town of Huntley. The rust originated, apparently, from a number of barberry shrubs around the barley field. On June 15th the rust was very light on the barley but was spreading heavily among the fox-tail. (Tehon)

New York: Ontario County. Where severe the plants did not ripen uniformly. (Chupp)

LEAF RUST CAUSED BY PUCCINIA ANOMALA ROSTR.

The leaf rust of barley was present over a considerable area of the United States, but it was of little importance. New York, Pennsylvania, Kentucky, Tennessee, Ohio, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Nebraska and Colorado reported traces.

Judging from the records since 1918, leaf rust of barley has never been serious in the United States as a whole during any single season. Occasionally one state has reported heavy infection during past years, as in the case of Arizona in 1920 when the disease was said to have caused considerably injury. California has reported damage at times. Occasionally a section of a state had considerable leaf rust, but no estimate of loss has ever been more than a trace. It would be interesting to know whether conditions will ever arise to produce an epidemic in the United States. Mains reported as follows:

> "A heavy development of the leaf rust of barley was observed at Knoxville, Tennessee, where a number of varieties showed 100% infection. That leaf rust of barley should develop to such an extent while only a little development of the leaf rust of wheat occurred is interesting."

Illinois: Six-row barley varieties were lightly infected. Odenbrucker showed the heaviest infection. (Tehon)

Wisconsin: Barley rust appeared before wheat or oat rust on the Experiment Station Farm but was not serious. (Valleau)

Recent literature:

Beck, O. Ein Infektionsversuch mit Puccinia simplex. Ann. Mycol. 22: 291-292. Nov. 1924.

STRIPE RUST CAUSED BY PUCCINIA GLUMARUM (SCHM.) ERIKS. & HENN.

Idaho: This disease was noted only on barley in the rust nursery. This is the first infection noted on barley in Idaho since 1915. (Hungerford)

COVERED SMUT CAUSED BY USTILAGO HORDEI (PERS.) KELL. & SW.

In general, records indicate that covered smut was somewhat more common than in 1922 or 1923. In 1921, however, covered smut was widespread and destructive on account of the very high percentage occurring in scattered regions in several states.

Table 42. Percentage losses from covered smut of barley in 1924, as estimated by collaborators.

Percentage loss	States
5	Virginia, Kentucky
3	Iowa, Alabama
2	Kansas
1.5	Idaho, Pennsylvania
1	Delaware, New York, Georgia, North Dakota, Washington
.5	Vermont, Connecticut, Texas, California
t	Utah, Indiana, Illinois, Michigan, Wisconsin, South Dakota, Colorado

Wisconsin: Wet season retarded seedling infection. (Vaughan)

Virginia: Covered smut found in all fields. Seems to be increasing and is now fully as prevalent as loose smut. Perfectly controlled with hot water and commercial control with formaldehyde in experimental plots. (Fromme)

Controlled at Arlington Farm with Semesan, Corona 620, Germisan, Chlorophol and Uspulun. (Tisdale)

California: Meager analysis show that the commonest and heaviest attack occurs in soil with Ph values about 5.7. Early sown barley is attacked most severely. (Mackie)

Recent literature:

Faris, J. A. Factors influencing infection of Hordeum sativum by Ustilago hordei. Amer. Jour. Bot. 11: 189-213. 1924.
Godkin, James. Barley seed treatment in Virginia. U. S. Dept. Agr. Office Coop. Ext. Work Extension Pathologist 2: 144. Dec. 1924. (mimeogr.)
Sartoris, George B. Studies in the life history and physiology of certain smuts. Amer. Jour. Bot. 11: 617-647. Dec. 1924.
Tisdale, W. H. Experiments on seed treatment at Arlington Farm. U. S. Dept. Agr. Office Coop. Ext. Work Extension Pathologist 2: 104-106. Oct. 1924. (mimeogr.)

LOOSE SMUT CAUSED BY USTILAGO NUDA (JENS.) KELL. & SW.

The several reports received would indicate that loose smut was approximately as abundant as the covered smut in the United States in 1924. Of the diseases attacking barley the smuts were the most important and caused the most damage.

Barley - Loose smut

Table 43. Percentage losses from loose smut of barley, as estimated by collaborators, 1924.

Percentage loss	States
5	Tennessee
4	Pennsylvania
3	Virginia, Indiana
2.5	New York, Kentucky
2	Illinois, Kansas, New Mexico
1.5	Connecticut
1	South Carolina, Georgia, Iowa, North Dakota, South Dakota
.5	Michigan, Texas
.2	Utah
t	Delaware, Wisconsin, Idaho, California, Colorado
0	Washington

The highest percentages reported are as follows:

Table 44. Maximum infections of barley loose smut found in fields, as reported by collaborators, 1924.

Highest percentage	State
40	New York
20	South Dakota
15	Pennsylvania
10	Illinois, Michigan, Minnesota, North Dakota
5	Georgia

Indiana: Hot water treatment has cleaned up loose smut in winter barley very generally in Harrison County. (Gregory)

Virginia: Perfectly controlled with hot water, formaldehyde, Semesan, and other disinfectants. (Fromme)

Arlington Farm. Controlled with Chlorophol, Corona 620, Germisan, Semesan and Uspulun. (Tisdale)

Minnesota: Black Lion susceptible. (Div. Pl. Path.)

Pennsylvania: Most varieties have smut but Black Lion appears more susceptible having 15% in the variety plots at State College. (Kirby)

In an article published recently, Tisdale and Tapke (1) show that the original floral infection of barley by the loose smut organism is not necessary for the production of loose smut in the crop. Infection of the seedling can occur directly. "Seedlings from inoculated seeds with the hulls not removed were not noticeably injured but some of them were infected," while "Seedlings from dehulled, inoculated seed of all varieties studied were severely injured and many failed to emerge." Surviving plants produce a high percentage of infected heads, except in the variety Nakano Wase, which "failed to become smutted in all experiments and apparently is highly resistant to invasion by the fungus after it enters the seedling."

Recent literature:

Cited

1. Tisdale, W. H., and V. F. Tapke. Infection of barley by Ustilago nuda through seed inoculation. Jour. Agr. Res. 29: 263-284. Sept. 15, 1924.

STRIPE CAUSED BY HELMINTHOSPORIUM GRAMINEUM RABH.

Stripe was apparently less prevalent than it has been in the last three seasons, although for the most part the estimates of loss do not vary greatly. In a few states stripe was very important. Hungerford reported that he noted it "in unusual amounts in Idaho, and also in Colorado, South Dakota, Montana, and Nebraska, this summer."

Table 45. Estimated losses from barley stripe, according to collaborators, 1924.

Percent loss	States
5	Iowa
2	South Dakota
1.8	Illinois
1.5	Wisconsin, Utah
1	North Carolina, North Dakota
.5	Ohio, Idaho
t	New York, Pennsylvania, Delaware, Virginia, Michigan, Louisiana, Colorado, Texas, Alabama, Washington, California
0	Connecticut

Iowa has reported the highest loss, 5%, each year during the last three years.

North Carolina: Most prevalent in the Piedmont Section. (Wolf)

Illinois: Records taken on 758 acres in several counties show that 1.8% loss occurred. (Tehon)

Wisconsin: Most important disease this year. Average of 28% in checks, last year same seed gave only 12%. None of seed treatments completely controlled stripe. Formaldehyde treatment best control, but caused high percent seedling injury. (Vaughan)

Minnesota: Much more abundant than usual. Minsturdi susceptible, contained 10 to 20% infection. (Sect. Pl. Path.)

North Dakota: Minsturdi most susceptible. Manchuria resistant. Controlled by two hour formaldehyde treatments but not generally practiced. (Weniger)

South Dakota: Rather common in barley throughout the eastern part of the state. (Evans)

Utah: Occurred in considerable quantities and no doubt this disease is a problem in barley production. (Richards)

Arizona: Occurred on imported barley in experimental plots at Sacaton. Three varieties or strains showed over 50% stripe while others showed only one or a few plants. (W. H. Tisdale)

Recent literature:

Smith, N. J. G. The parasitism of Helminthosporium gramineum, Rab. (Leaf-stripe disease of barley). (Abstract) Proc. Cambridge Phil. Soc. Biol. Sci. 1: 132-133. Apr. 1924.

SPOTBLOTCH CAUSED BY HELMINTHOSPORIUM SATIVUM PAM., KING, & BAK.

Spotblotch occurs wherever barley is grown. In general it may be said that the disease caused slightly more damage than last year.

Pennsylvania: Common and rather severe on Black Lion, Featherstone, and Odenbrucker varieties in experimental plots. (Kirby)

Minnesota: Less abundant than usual. Damage from rootrot appeared rather late.

South Dakota: Losses as high as 60% reported from some fields in McPherson County. (Evans)

South Dakota reports 2% loss; Pennsylvania, Minnesota and New York 1%; and traces are reported from Illinois, Wisconsin, Iowa, and North Dakota. It was reported as occurring in Indiana, Montana, and Idaho.

Recent literature:

Hayes, H. K., E. C. Stakman, F. Griffee, and J. J. Christensen. Reaction of barley varieties to Helminthosporium sativum. Minnesota Agr. Exp. Sta. Tech. Bul. 21: 1-47. July 1923.

NETBLOTCH CAUSED BY HELMINTHOSPORIUM TERES SACC.

Netblotch was less destructive than spotblotch. Iowa reported a loss of 5%, but in no other case was over a trace of damage estimated. Other states reporting it were New York, Pennsylvania, Indiana, Wisconsin, Minnesota, North Dakota, Colorado and Idaho. Several comments by collaborators are of interest.

Wisconsin: Control less satisfactory than in 1923. (Vaughan)

Iowa: Very general and destructive in the northern counties. (Porter)

North Dakota: Common on volunteer seedlings after harvest of crop. (Weniger)

SCALD CAUSED BY RHYNCHOSPORIUM SECALIS (OUD.) DAVIS

This disease has been reported from the Upper Mississippi Valley, the Pacific Northwest, and California. In 1924 reports were received from Wisconsin, Iowa, Idaho, and California.

Wisconsin: More abundant in certain fields than it has been noted before. (Cereal Courier 16: July 10, 1924.)

SCAB CAUSED BY GIBBERELLA SAUBINETII (MONT.) SACC.

Two percent loss was reported from Iowa and 1.5% from Illinois. Traces were recorded from New York, Pennsylvania, Ohio, Wisconsin, and North Dakota.

Illinois: Barley scab has been serious like the scab on wheat and rye. At Rochelle, one small field had half of the heads scabby. Several fields of that region had 20 to 30% scabby heads. Since barley began to ripen, fields usually showed 1 to 5% scab. Generally, only one or a few sets of glumes or a few grains were attacked, so that the actual damage is rather small. Scab is occasionally seen on cheat also. (Young)

Infection as high as 52% on the spikelets. Odenbrucker ran from 18 to 30%. (Tehon)

OTHER DISEASES

Bacterium translucens Jones, Johnson & Reddy, bacterial blight, was reported as appearing in very slight quantities in Minnesota and Texas.

Barley - Other diseases

Claviceps purpurea (Fr.) Tul. Traces of ergot were reported from Colorado, Iowa, Illinois, Wisconsin, Minnesota, and North Dakota. According to Tehon this is the first time it has been found in Illinois, where it occurred in several fields, but in very small quantities.

Colletotrichum graminicolum (Ces.) Wils. Anthracnose was of little importance in 1924. Iowa, Pennsylvania, Texas, Indiana, and Illinois reported traces. In Indiana there was more than usual.

Erysiphe graminis DC., powdery mildew. New York, Illinois, Minnesota, New Jersey and Delaware reported traces. It is reported for the first time in Illinois, on two and six-row varieties of barley. Kirby reported a loss of 1% in Pennsylvania, stating that it was prevalent on Featherstone and Odenbrucker varieties.

OATS

OAT SMUTS CAUSED BY USTILAGO AVENAE (PERS.) JENS. AND U. LEVIS (KELL. & SW.) MAGN.

The covered and loose smuts have not been distinguished in many of the reports, therefore, they are being dealt with under one heading.

A list of the estimated loss in the various states is given in table 46, and the maximum percentages noted in fields in table 47.

Table 46. Percentage reduction in yield caused by the smuts of oats, as estimated by collaborators, 1924.

Percentage loss	States
15	Arkansas
8	Kentucky
6	Virginia
5.5	Pennsylvania, Tennessee
5	South Carolina, Iowa
4	New York, Utah
3	New Jersey, Michigan, Mississippi, Maryland
2.5	North Carolina, Wisconsin
2	Connecticut, Idaho, Vermont, Indiana, North Dakota, South Dakota, Kansas, New Mexico
1.5	Ohio, Illinois
1	Delaware, West Virginia, Texas
.5	Washington
t	New Hampshire, Louisiana, California

Oats - Smuts

Table 47. Maximum percentages of infection with oat smuts noted in fields, as reported by collaborators.

Maximum percentage noted in fields	State	Maximum percentage noted in fields	State
50	Arkansas	18	North Dakota
46	Wisconsin		Pennsylvania
36	Ohio	15	Georgia
35	Illinois	10	New Jersey,
30	Minnesota		South Dakota
	Alabama	4	Delaware
26	Pennsylvania	2	Nebraska
25	Iowa		
20	Virginia		
	Mississippi		

Virginia: Smut so general in fields grown, only a few of them passed inspection. (Fromme)

West Virginia: Covered smut, *Ustilago levis*, was found abundantly in Preston County (elevation 2000 feet) while loose smut was found quite plentiful at lower elevations. (Giddings)

Illinois: Loose smut will be, among diseases, the chief source of loss this season. In southern Illinois the infection was lightest, ranging around 3%; but in the north the infection was much more severe. Counts of 7%, 10%, and 15% were the rule, while 20% and even 35% were by no means rare. The higher losses are of especial importance because they occurred in the oat growing section. Actual counts of shocked oats have run as high as 23%, 27%, 31%, 39% and even 55%. Counts of 25% were very common in the northeast. (Tehon)

Louisiana: Considerable in some fields. Practically none as usual in fields grown from south Louisiana seed. (Edgerton)

Arkansas: Apparently cold wet winter and spring favored development of smut. (Dept. Pl. Path.)

Control measures:

Idaho: Modified spray treatment (one part formaldehyde to 10 parts of water) used extensively with fine results. (Hungerford)

North Dakota: Seed treatment not as generally practiced as for wheat. Dust treatments not effective for smut control. (Weniger)

Wisconsin: Seed treatment with formaldehyde very good. (Vaughan)

Kansas: Formaldehyde mist method is exclusively recommended. Perfect results are always secured. Treatment for smut control is being used extensively on account of the large acreage of Kanota which is resistant. (Melchers)

Recent literature:

Arland, A. Der Hafer Flugbrand, Ustilago avenae (Pers.) Jens. Biologische Untersuchungem mit besonderer Berücksichtigung der Infektions - und Anföllligkeitsfrage. Bot. Arch. 7: 70-111. July 1, 1924.

Barney, A. F. The inheritance of smut resistance in crosses of certain varieties of oats. Jour. Amer. Soc. Agron. 16: 283-291. 1924.

Dickson, B. T., R. Summerby, and J. G. Coulson. Smut control experiments in hull-less oats during 1923. (Abstract) Phytopath. 14: 350. July 1924.

Gaines, E. F. Inheritance of disease resistance in wheat and oats. (Abstract) Phytopath. 15: 51. Jan. 1925.

Gordon, W. L. Studies concerning injury to seed oats after smut disinfection. Ann. Rept. Quebec Soc. Prot. Plants 16: 79-94. 1925.

Reed, G. M. Physiologic races of oat smuts. Amer. Jour. Bot. 11: 483-492. July 1924.

Reed, G. M., and J. A. Faris. Influence of environmental factors on the infection of sorghums and oats by smuts. II. Experiments with covered smut of oats and general considerations. Amer. Jour. Bot. 11: 579-599. Nov. 1924.

Stadler, L. J. The variety as a unit in studies of disease resistance. (Abstract) Phytopath. 15: 51. Jan. 1925.

Thomas, R. C. Effective dust treatments for the control of smut of oats. Science n. s. 61: 47-48. Jan. 9, 1925.

Tisdale, W. H. Experiments on seed treatment at Arlington Farm. U. S. Dept. Agr. Office Coop. Ext. Work Extension Pathologist 2: 104-106. Oct. 1924. (mimeogr.)

Zade, Adolf. Experimentelle Untersuchungen über die Infektion des Hafers durch den Hafer-Flugbrand (Ustilago avenae Jens.) (Experimental investigations on the infection of oats by Ustilago avenae Jens.) Fühl. Landw. Zeit. 71: 393-406. 1922.

____________ Neuere Untersuchungen uber die Lebensweise und Bekämpfung des Hafer-flugbrandes (Ustilato avenae (Pers.) Jens.) Angew. Bot. 6: 113-125. May-June 1924.

Zundel, George L. Seed treatment in Washington. U. S. Dept. Agr. Office Coop. Ext. Work Extension Pathologist 2: 101-102. Oct. 1924. (mimeogr.)

BLAST (CAUSE UNDETERMINED)

Oat blast, or sterility of part of the panicle, is a trouble which has been known for a long time, but its cause is still unknown. All attempts to prove the presence of a pathogenic organism have failed. The trouble is widespread where oats are grown, although it does not appear to be equally serious in all states.

It undoubtedly causes as much damage as, or more damage than, smut or any other oat disease in several states, and it is believed that for the most part the losses estimated have been too conservative. When entire fields show from a trace to one-third or one-half of every panicle destoryed from blast, it is evident that an appreciable reduction in yield must result. In Kansas oat blast occurs every year in every field in the state. This situation will probably hold for other states.

Table 48. Estimated percentage loss caused by blast 1924, as reported by collaborators.

Percentage loss	States
8	Illinois
5	Minnesota, Kansas
2	Iowa
1	New York, Pennsylvania, Ohio, South Dakota
.5	Arkansas, North Dakota
t	Kentucky, Wisconsin, Idaho, Maryland

Illinois: The volunteer oats have had lots of blast, those headed out often showing 20 to 30% of the spikelets blasted. I had thought that our late, cold, wet spring caused the blast to be unusually abundant in the crop this summer, but that theory is hardly tenable any more, since the blast on the volunteer oats did not develop under such conditions. (Young)

Kansas: Blast not confined to any particular part of the panicle. It causes greater loss than oat smuts in Kansas. (Melchers)

CROWN RUST CAUSED BY PUCCINIA CORONATA CDA.

Crown rust was not nearly so widespread nor injurious as it was in 1921, 1922, nor 1923. As in the case of other cereal rusts in 1924 crown rust was of little importance in reducing the yield. Undoubtedly the same environmental factors which held the other cereal leaf rusts in check were responsible for the small amount of crown rust.

The following comments of collaborators are of interest.

Florida: Crown rust widespread, but not nearly as important a factor as it was the year before. (Weber)

Mississippi: Said to be causing considerable damage in a field of Fulghum oats. The disease was no doubt general over the state and caused about the same amount of damage as last year. (Neal)

Louisiana: The cold winter prevented planting until too late with the result that the rust did not get started until late. There was no volunteer or early oats to carry the disease over. (Edgerton)

Arkansas: Less noted than in any previous year. Probably associated with abnormally cold winter and spring. (Dept. Pl. Path.)

Ohio: Crown rust appeared rather late in the season. In the northern counties it became serious, these being killed prematurely. (Young)

Illinois: Crown rust infection much less heavy than usual and later in the season. Almost obscured by stem rust. (Tehon)

North Dakota: Neither barley nor oats has been heavily infected for the past two years. Spring very late and cool. Conditions not favorable for infection. (Weniger)

California: Crown rust entirely absent this year. It is not a factor in oat production here. Crown rust on Notholcus, Lolium, etc., is usually abundant. (Mackie)

Several reports have been made of the rust on species of Rhamnus.

Dates of observation of crown rust on Rhamnus, 1924:

May 21 (pycnia)	Nebraska	June 9	Massachusetts
May 27 (aecia)	Nebraska	June 10	South Dakota
June 1	Montana	June 16	Iowa
June 5	Wisconsin	June 27	Connecticut
June 6	Minnesota	July 1	Montana
June 7	New York	July 8	Vermont

Relation of buckthorn to crown rust:

Wisconsin: Very prevalent in the vicinity of buckthorn. (Vaughan)

South Dakota: Aecia were found on Rhamnus cathartica on June 10. (Evans)

Iowa: General infection on Rhamnus lanceolata but unfavorable weather prevented rapid spread. Rhamnus lanceolata first infected May 6, Lucas County. (Porter)

Nebraska: Pycnia first observed on Rhamnus May 21 at Lincoln. Most of the infection on northwest side of the bushes. Aecia observed May 27 and they were all open the next week. No crown rust was noted on oats at the College Farm. (Goss)

Wisconsin: Crown rust Puccinia coronata was observed June 5 on Rhamnus cathartica bushes. (Vaughan)

Massachusetts: First Rhamnus cathartica by Puccinia coronata June 9. (Davis)

Minnesota: Very light infection reported from the northern part of the state during the latter part of July. Several heavy local infections near Rhamnus were found in Sibley, Renville, Kandiyohi and Swift Counties where the rust had quite clearly spread from the hedge. Many fields were almost free from crown rust. (Sect. Pl. Path.)

Recent literature:

Dietz, S. M. Alternate hosts of Puccinia coronata Corda. (Abstract) Phytopath. 15: 54. Jan. 1925.

Parker, J. H. Experiencias comparativas sobre resistencia de variedades de avena a la roya o herrumbre. Defensa Agr. Uruguay 5: 46-47. Feb. 1924.

STEM RUST CAUSED BY PUCCINIA GRAMINIS PERS.

Stem rust of oats caused very little damage in 1924. The largest percentage reported was 3% from South Dakota. Most of the states indicated only a trace or no loss.

There was less stem rust than in 1921 and 1922. In general it may be said the estimated loss for 1924 was about the same as for 1923. The largest single loss, 3%, was reported from South Dakota.

Table 49. Estimated percentage loss caused by stem rust, 1924, as reported by collaborators.

Percentage loss	States
3	South Dakota
2	New Mexico
1.5	North Dakota
1	New Hampshire, Vermont, Connecticut, Texas, Kansas, Michigan, Wisconsin, Iowa
.5	Ohio, Illinois
t	New York, Virginia, West Virginia, Arkansas, Idaho, Washington, California
0	Kentucky, Mississippi, Louisiana, Nebraska, Montana, Wyoming, Colorado

Pennsylvania: Much worse on late planted fields and on late maturing fields except White Russian which is resistant. (Kirby & Orton)

Illinois: Black stem rust is also abundant, nearly all the straws in fields of some sections showing rust. However, as is generally true for black stem rust in Illinois, the attack came too late to do serious damage. Cool weather in June seems to be the chief reason why oats were not damaged seriously this year. (Young)

This was the most general as well as the most severe attack of stem rust of oats that we have observed in Illinois. (Tehon)

Minnesota: Reported slightly heavier than on wheat, but did not do much damage. (Sect. Pl. Path.)

North Dakota: Cool weather from seeding to harvest reduced rust losses except in certain isolated localities where individual fields were badly infected. (Weniger)

Kansas: No serious injury reported although many fields showed considerable infection due to lateness of the crop. (Melchers)

Recent literature:

Dietz, S. M. The inheritance of resistance to Puccinia graminis avenae. (Abstract) Phytopath. 15: 54. Jan. 1925.
Mackie, W. W., and R. F. Allen. The resistance of oat varieties to stem rust. Jour. Agr. Res. 28: 705-720. May 17, 1924

HALO BLIGHT CAUSED BY BACTERIUM CORONAFACIENS C. ELLIOTT

The following states reported the occurrence of halo blight in 1924: New Jersey, Pennsylvania, Kentucky, Arkansas, Ohio, Illinois, Wisconsin, Minnesota, Iowa, North Dakota, South Dakota, Kansas, Montana and Idaho. In most cases no injury occurred.

South Dakota: Very evident. Apparently doing no damage. (Evans)

North Dakota: More severe on early than on later plantings. Common on White Tartar. (Weniger)

Iowa: Quite general this year, but caused little or no appreciable damage. (Porter)

California: Usually common, but did not appear this year in noticeable amounts. (Mackie)

Minnesota: There appears to be marked variation in varietal susceptibility. (Sect. Pl. Path.)

FOOT AND ROOTROTS DUE TO VARIOUS CAUSES

In Minnesota destruction of roots and severe foot infection occurs generally, although there is more in the southern part. Fusarium, Alternaria, Helminthosporium and Brachysporium were isolated from diseased parts. It was of considerable importance, causing a loss estimated at 1%. Valleau reported that "Root diseases are usually very severe on oats in Kentucky. This year with low soil temperatures injury was much less than usual." In Wisconsin there seemed to be less seedling blight than usual. A rootrot due to an undetermined fungus was reported from Washington.

SCAB CAUSED BY GIBBERELLA SAUBINETII (MONT.) SACC.

This disease was observed on a few panicles on several occasions in the following states: New York, Pennsylvania, Maryland, Illinois, Wisconsin, and Iowa.

Illinois: Scab frequently seen infecting occasional heads in fields. It did not do much damage. However, examinations of shocks in north central Illinois show as high as 1% of the spikelets with a pink mold so that a little damage was done as a shock mold. (Young)

LEAFSPOT CAUSED BY HELMINTHOSPORIUM AVENAE EIDAM

This disease has been known to be widely distributed in past seasons. In 1924 it was reported from Alabama, Indiana, Illinois, Wisconsin, and Minnesota. In no instance did it cause any appreciable injury. A leafspot reported as Helminthosporium sp. occurred in Delaware, Pennsylvania, Vermont, and New York.

Florida: This disease caused considerable dying of the older leaves when the plants were young. Not a factor on older plants. (Weber)

Indiana: Apparent varietal difference in susceptibility. (Mains)

Wisconsin: Damage seemed to be entirely outgrown with the progress of the crop. (Vaughan)

Delaware: Most prevalent leaf disease observed on oats. (Adams)

OTHER DISEASES AND INJURIES

Claviceps purpurea (Fr.) Tul. Ergot was reported as occurring in North Dakota. A few specimens have also been collected in Kansas.

Colletotrichum graminicolum (Ces.) Wils. In 1924 anthracnose was reported from New York, Pennsylvania, Texas, Illinois, and Wisconsin. No appreciable damage was recorded.

Erysiphe graminis DC. Powdery mildew was statewide in distribution in New York. (Chupp)

Leaf tipburn (non-parasitic) Causes a withering and dying of leaf tip. In general this corresponds with the area of severest smut. (Tehon)

Scolecotrichum graminis Fckl. This leafspot has been reported from Illinois by Tehon. The maximum found in any one field was 5%. The only other report to the Survey of its occurrence on oats was from New York in 1923. This organism is known to occur on grasses and was reported by Pammel (Jour. Myc. 7: 96) as injurious to barley in the United States in 1891.

CORN

SMUT CAUSED BY USTILAGO ZEAE (BECKM.) UNG.

The smut of maize seemed to be somewhat less prevalent in 1924 than in 1923, although the difference is slight. In 1921 a serious outbreak was reported, but each year then smut has been a little less serious. The smut of maize is one of the major cereal disease problems in the United States. The annual loss is immense as shown in table 51 which gives the annual loss for the United States and the average loss for each state for the period 1918 to 1924 inclusive.

The estimated losses for 1924 by states are also shown in table 50. Some of the greatest losses occur in Kansas and nearby states. It has been found in studies in Kansas that the yielding capacity of a corn plant severely attacked at one or more nodes is reduced about one-third.

Table 50. Estimated losses from corn smut as reported by collaborators, 1924.

Percentage loss	States
10	California
5	Pennsylvania
4	North Dakota
3.3	Illinois
3	Connecticut, Ohio, Iowa, Kansas, New Mexico
2	New York, North Carolina, Georgia
1.5	Virginia
1	Vermont, West Virginia, South Carolina, Utah
.5	New Jersey, Delaware, Indiana, Kentucky, Texas, Washington
t	New Hampshire, Michigan, Wisconsin, South Dakota, Mississippi, Louisiana, Arkansas, Idaho

Weather relations:

It has been a somewhat common opinion that corn smut is most prevalent in areas of relatively high humidity. This is erroneous, for some of the greatest damage from the disease occurs in the Great Plains area

Table 51. Estimated percentage reduction in yield of corn due to smut from 1918 to 1924 inclusive#.

State	Percentage reduction in yield due to corn smut							
	1918	1919	1920	1921	1922	1923	°1924	Average**
Me.	t	–	–	–	t	–	–	t
N. H.	–	*–	–	*–	t	–	t	t
Vt.	–	0.5	3.	3.	2.	1.	1.	1.7
Mass.	0.5	0.5	0.5	0.5	t	0.5	–	0.4
R. I.	–	0.5	0.5	*–	–	–	–	0.5
Conn.	0.1	0.5	0.5	1.5	1.5	3.	3.	1.4
N. Y.	1.	0.5	1.	1.	3.	2.	2.	1.5
N. J.	1.	1.	1.	1.	1.5	0.5	0.5	0.9
Pa.	3.	2.	1.	1.	3.	3.	5.	2.6
Del.	–	1.	1.	0.5	0.5	1.	0.5	0.7
Md.	1.	1.5	1.	2.	2.	1.5	–	1.5
Va.	1.	1.	1.	2.	1.	2.	1.5	1.3
W. Va.	4.	2.	1.	2.	2.	1.	1.	1.8
N. C.	3.	2.	2.	20.	–	2.	2.	5.0
S. C.	2.	3.	2.	5.	2.5	1.	1.	2.3
Ga.	5.	3.	2.	2.	2.	2.5	2.	2.6
Fla.	–	–	–	–	1.	–	–	1.
Ohio	3.	2.	1.	3.	3.	3.	3.	2.6
Ind.	–	3.	2.	0.5	0.3	0.4	0.4	0.9
Ill.	1.5	2.	2.	3.5	2.	3.	3.3	2.4
Mich.	1.	2.	0.5	2.	2.	1.	t	1.2
Wis.	0.5	1.	t	2.	t	0.5	t	0.6
Minn.	0.5	1.	1.	3.	t	0.5	–	0.8
Iowa	2.5	3.	1.	1.5	2.	3.	3.	2.3
Mo.	1.	2.	2.	3.	–	2.	–	2.
N. D.	1.5	1.	0.5	1.	3.	5.	4.	2.3
S. D.	5.	2.	1.	15.	3.	2.	t	4.
Nebr.	5.	3.	5.	*–	–	–	2.5	3.9
Kans.	8.	5.	8.	5.	5.	4.	3.	5.4
Ky.	1.5	2.	2.	1.5	0.5	0.5	0.5	1.2
Tenn.	7.	2.	1.	2.	2.	0.5	–	2.4
Ala.	2.5	1.	1.	*–	1.	2.	–	1.5
Miss.	0.5	1.	1.	1.	2.	t	t	0.8
La.	1.5	0.5	0.5	1.	t	t	t	0.5
Texas	8.	3.	2.	3.	2.	t	0.5	2.6
Okla.	4.	3.	2.	*–	–	–	–	3.0
Ark.	0.2	t	2.	4	3.	3.	t	1.9
Mont.	t	–	t	–	–	–	–	t
Wyo.	t	–	t	–	–	–	–	t
Colo.	30.	5.	5.	2.5	2.	1.5	–	7.7
N. Mex.	5.	1.	2.	–	–	3.	3.	2.8
Ariz.	2.	–	5.	–	*–	t	–	2.3
Utah	t	–	1.	1.	1.5	1.	1.	0.9
Nev.	t	t	t	–	–	–	–	t
Idaho	t	–	t	–	t	t	t	t
Wash.	t	t	t	1.	t	t	0.5	0.2
Oregon	t	t	t	t	t	–	–	t
Calif.	t	–	2.	10.	5.	–	10.	5.4
U. S.	2.6	2.23	2.04	3.1	1.6	1.8	°1.6	2.1
tal bushels	70,876	69,603	70,477	104,533	48,615	62,741	°39,689	66,648

= Three ciphers (000) omitted from total bushels.

** = Average based only on years in which estimates were made.

° = 1924 estimates tentative only.

where high temperatures and comparative dryness prevail. Furthermore, corn smut conidia can withstand a great deal of dessication without injury to their vitality.

Corn varietal and line differences in susceptibility:

It is commonly accepted that sweet corn is more susceptible to injury from smut than field varieties. There is some slight evidence that differences in susceptibility between field corn varieties exists, but there are more data to the contrary. This is to be expected on account of the heterozygous condition of corn varieties. There is ample evidence, however, to show that inbred lines of most varieties of maize, including sweet corn, can be secured that are resistant to smut.

States which are emphasizing the study of corn smut from the breeding standpoint are Kansas, Connecticut, and Minnesota.

Statements by collaborators:

New York: Most prevalent on sweet corn. One patch of several rods in diameter found in field corn where every stalk was affected. (Chupp)

Arkansas: Unlike most years there was but little smut on sweet corn this year. Field corn showed heavier infection, but even then it was less than usual. (Dept. Pl. Path.)

Illinois: Corn smut has been unusually bad this year. Most fields show 3 to 10% of the stalks infected with 1 to 5% loss of ears. Two exceptional cases should be noted. The edges of two fields ran 38% and 43% infested stalks respectively. Ear loss was 19% and 29% respectively. The opposite side of the worst field had only 3% smut and 1% ear loss. In the first field infection was much lighter farther into the field. Many corn stalks this year are only 3 to 4 feet high and end in a mass of smut so the loss includes fodder in such cases. (Young)

Wisconsin: Somewhat more prevalent than usual. (Vaughan)

Iowa: Somewhat less smut than usual. (Porter)

Kansas: Less smut than usual. Generally distributed over the state, but more prevalent in the western part. Cooler spring apparently held smut in check. (Melchers)

New Mexico: Decidedly more severe on sweet corn. (Crawford)

California: Corn smut is a limiting factor in maize production in many areas in California. The attack this year was normal, many fields showing every plant infected. The estimated loss may be 10-15%. King Phillips hybrid commonly grown in the Delta regions of the Sacramento and San Joaquin Rivers is quite resistant and seldom expresses more than a trace of injury. (Mackie)

Recent literature:

Haynes, H. K., E. C. Stakman, F. Griffee, and J. J. Chrsitensen. Reactions of selfed lines of maize to Ustilago zeae. Phytopath. 14: 268-280. June 1924.

Sartoris, Geroge B. Studies in the life history and physiology of certain smuts. Amer. Jour. Bot. 11: 617-647. Dec. 1924.

DRYROT CAUSED BY DIPLODIA ZEAE LÉV.

The organism causing this disease is found generally wherever corn is grown. It may produce ear, stalk, or seedling injury. The losses caused by the ear rot reported in 1924 are given in table 52.

Table 52. Percentage loss caused by ear rot, as estimated by collaborators, 1924.

Percentage loss	States
5	Iowa
4	Virginia, South Georgia
3.5	Delaware
3	Kansas
1	West Virginia, Wisconsin
.5	Pennsylvania
t	New York, Indiana

For the most part the states reported the injury as due to Diplodia zeae, however, in a number of cases, as in Delaware, Kentucky, south Georgia, and Indiana, Fusarium spp. were associated with Diplodia, and in some instances were thought to be of as much importance as the latter organism in causing ear rot.

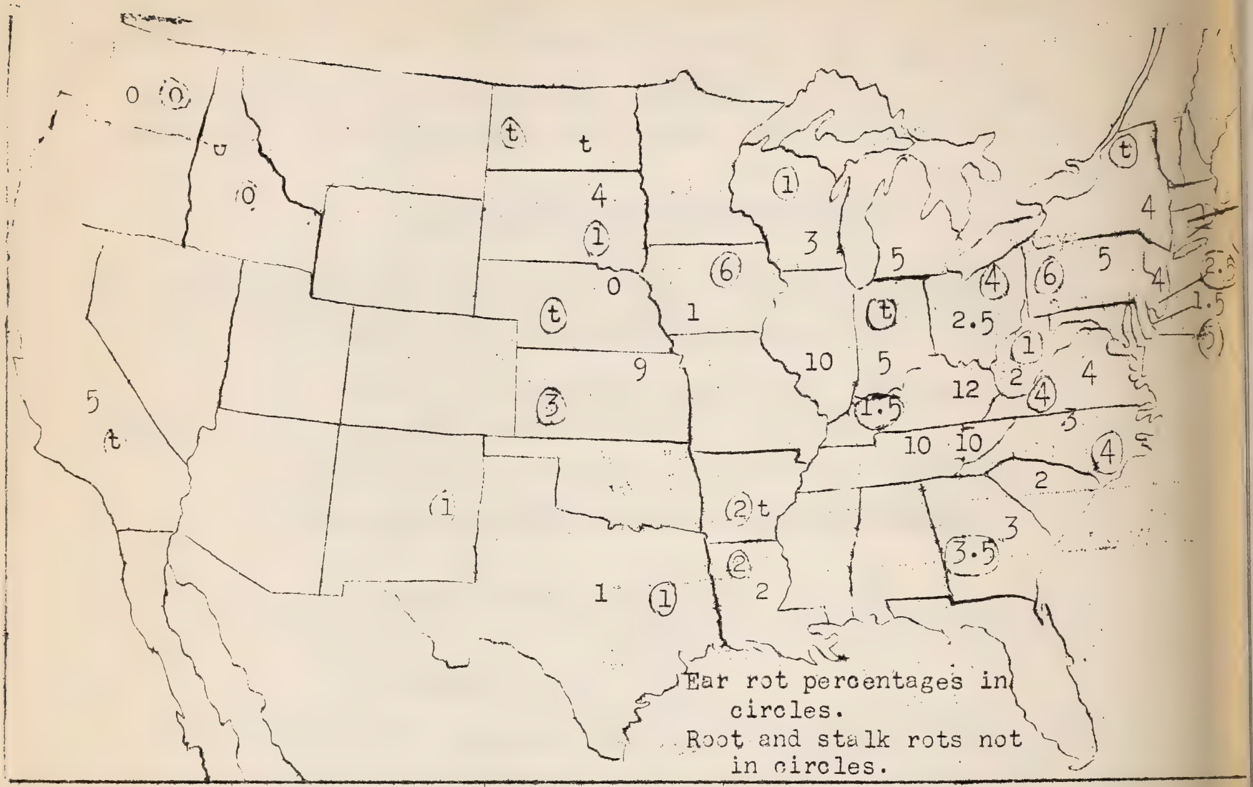
Recent literature:

Durrell, L. W. Dryrots of corn and their control. Iowa Univ. Ext. Serv. Agr. & Home Econ. Ext. Bul. 122. June 1924.

ROOT, STALK, AND EAR ROTS OF CORN ASSOCIATED WITH DIPLODIA, GIBBERELLA, AND FUSARIUM SPP.

An examination of the records submitted by collaborators shows that it is very difficult to determine the relative importance of Diplodia, Gibberella, and Fusarium as causes of root, stalk, and ear rots; also, some reports show that soil conditions are responsible for root and stalk rots, either by themselves or in conjunction with, these organisms. Other factors which entered into this problem in 1924, adding to the difficulty of estimating losses, were the appearance of the corn borer, and the unusually cool spring which produced poor stands and necessitated replanting.

Corn - Root, stalk and ear rots



Ear rot percentages in circles.
Root and stalk rots not in circles.

Fig. 2. Estimated percentage of loss from root, stalk and ear rots of corn, as report
by collaborators, 1924.

According to the estimates, the root, stalk, and ear rots cause greater losses than any other disease of corn. Wherever means can be found to reduce these losses it means an immense saving

Several statements by collaborators are of interest.

New Jersey: Fields observed in Monmouth and Somerset Counties showed heavy infection of corn rootrot. In several instances 50% of the plants were killed. Probably most severe in low spots. (Martin & Haenseler)

Maryland: Greater losses on poorer soils. Some control has been obtained by four years' selection of resistant strains. (Jehle & Temple)

Florida: Rootrot, Fusarium moniliforme, was found in several localities in the state doing minor injury. (Weber)

Illinois: Effects of rootrots are heightened and largely masked from the survey point of view by the unusual abundance of southern corn root worm. (Tehon)

Kansas: Fusarium moniliforme, Rhizopus sp., and Penicillium sp. most common on seed corn. Diplodia zeae unusually prevalent for Kansas on the crop of 1923. Gibberella saubinetii very rare. (Melchers)

Recent literature:

Branstetter, B. B. Corn rootrot. Missouri Sta. Circ. 117: 1-8. 1924.

Hoffer, G. N. and J. F. Trost. Influence of balanced nutrient supply on susceptibility of corn plants to Gibberella saubinetii (Mont.) Sacc. (Abstract) Phytopath. 15: 59-60. Jan. 1925.

Holbert, J. R., W. L. Burlison, B. Koehler, G. H. Woodworth, and G. H. Dungan. Corn root, stalk and ear rot diseases and their control through seed selection and breeding. Illinois Agr. Exp. Sta. Bul. 255: 239-478. Aug. 1924.

Holbert, James R., and Benjamin Koehler. Anchorage and extent of corn root systems. Jour. Agr. Res. 27: 71-78. 1924.

Jehle, R. A., F. W. Oldenburg, C. E. Temple. Relation of internal cob-discoloration to yield in corn. (Second progress report). (Abstract) Phytopath. 15: 52. Jan. 1925.

Koehler, B., J. G. Dickson, and J. R. Holbert. Wheat scab and corn rootrot caused by Gibberella saubinetii in relation to crop succession. Jour. Agr. Res. 27: 861-880. 1924.

Manns, T. F., and C. E. Phillips. Corn rootrot studies. Jour. Agr. Res. 27: 957-964. Mar. 22, 1924.

Moore, W. D. Corn root and ear rot studies. New Jersey Agr. Exp. Sta. Ann. Rept. 44: 404-407. 1924.

Tiemann, O. P. Physical characteristics of disease-free seed corn. Jour. Amer. Soc. Agron. 16: 37-40. 1924.

RUST CAUSED BY PUCCINIA SORGHI SCHW.

Rust of maize seems to have been decidedly more abundant than last year. Indiana, Illinois, Wisconsin, Iowa, North Dakota, and Kansas reported its prevalence as "more" or "much more," although no appreciable loss occurred in those states. In other sections of the country it appeared to be about the same.

One might infer that the cool, backward spring was favorable for corn rust infection and spread. Traces of injury were reported by New York, Pennsylvania, Indiana, South Georgia, Alabama, Mississippi, Wisconsin, Iowa, North Dakota, and South Dakota, while North Carolina reported 1%, Illinois, 0.5% and Iowa 3% reduction in yield of sweet corn.

Kansas: Experiments in Kansas with inbred lines of corn of such varieties as Pride of Saline, Commercial White and Colby Bloody Butcher show very outstanding differences in reaction to rust. Lines are showing from 100% susceptibility to 0% infection. (Johnston & Melchers)

Florida: This disease was rather severe during July 1923 in the vicinity of Gainesville and early in 1924 in south Florida. It was widespread and common. (Weber)

Illinois: This disease is unusually abundant in corn in the northern half of the state this year. Two fields of sweet corn showed about 85% of the leaves infected. One garden patch in Mercer County had heavy rust on most of the leaves. (Young)

Recent literature:

Reyes, G. M. On the occurrence of maize rust in the Philippines. Philippine Agr. Rev. 17: 3-9. 1924.
Rice, Mabel A. Internal sori of Puccinia sorghi. Bul. Torrey Bot. Club 51: 37-50. 1924.

BACTERIAL WILT CAUSED BY APLANOBACTER STEWARTII (EFS.) McCUL.

Bacterial wilt was reported from Kansas, New York, Maryland, West Virginia, Mississippi, Ohio, Indiana, and North Dakota. In all cases it was causing only a trace of damage to sweet corn, although several instances are cited where injury to individual fields was large.

West Virginia: Golden Bantam very susceptible. (Giddings)

Kansas: In the vicinity of Kansas City it was causing 30% loss in some fields. (Melchers)

North Dakota: Growing season not favorable for development of corn and more favorable for the disease than for several years past. (Weniger)

Recent literature:

Rand, Frederick V. and Lillian C. Cash. Further evidence of insect dissemination of bacterial wilt of corn. Science n.s. 59: 67-69. 1924.
Thomas, R. C. Stewart's disease or bacterial wilt of sugar corn. Month. Bul. Ohio Agr. Exp. Sta. 9: 81-84. May-June 1924.

BROWNSPOT CAUSED BY PHYSODERMA ZEAE-MAYDIS SHAW.

Brownspot has in past years been destructive only in the southern states. Although it has occurred in the corn belt, it has never assumed an alarming condition in that region.

Illinois: Physoderma brownspot is abundant, most fields showing 10 to 100% of the stalks infected. This disease is not known to injure corn seriously in this state. (Young)

Florida: This disease was found in a field near Miami causing considerable damage. Forty percent of the plants were affected. Quite common and generally distributed over the state. (Weber)

Table 53. Percentage loss from brownspot, as estimated by collaborators, 1924.

Percentage loss	States
5	South Georgia
1	Illinois
.5	North Carolina, Florida, Alabama
.3	Mississippi
t	Maryland
0	Kansas, Arkansas

OTHER DISEASES

Bacterial leafspot (undetermined), Idaho, Texas, and Florida.

Bacterium dissolvens Rosen. Bacterial rootrot was more severe on sweet corn this year in Arkansas than in any previous year, according to Rosen. A trace of damage is recorded for field corn. This disease does not seem to be widespread, since it has not been reported definitely from any other state.

Cephalosporium acremonium Cda. The following losses due to blackbundle disease were reported this year:, Illinois, 3%; Pennsylvania, 0.5%; In Illinois, Holbert made the following observation last summer.

> "During a recent tour through southeastern, southern and southwestern Illinois I found very heavy infections of the blackbundle disease of corn. It was my observation that the Illinois Plant Disease Survey did not report this infection any too high. This year it seems to be the prevailing corn disease in that territory." (Pl. Dis. Reporter 8: 97. Oct. 1, 1924.)

Coniosporium gerevi Bub. (Basisporium gallarum Moll.) Cobrot was reported from Connecticut and Iowa. In Iowa, Porter reports a trace of injury on sweet corn, while on field varieties he states 2% damage occurs.

Helminthosporium sp. A new leaf disease of corn recently reported by Drechsler (2) as occurring in Florida.

Helminthosporium sp., associated with stalkcanker, was observed by Boyd in south Georgia. Apparent infection at nodes; greenish discoloration. Isolations produced only pure cultures of Helminthosporium.

Helminthosporium turcicum Pass., leafblight, was reported from Pennsylvania and Florida.

Mosaic (undetermined). Louisiana. Edgerton reports from 2 to 3% reduction in yield.

Phyllosticta sp., causing leafspot, was widely distributed in Florida but caused no damage. In 1923 it caused early firing of many corn fields and was widespread and generally severe, seriously damaging field crops. (Weber)

Corn - Other diseases

Sorosporium reilianum (Kuehn) McAlp. Head smut has occasionally been found in fields of maize in the United States, perhaps most frequently in Washington. Its occurrence in New York and Idaho was reported for the first time this year. The following states have reported it up to 1924: Kansas, Ohio, California, Washington, Idaho, and New York.

Yellow leafspot (undetermined). Arkansas, "Probably no spreading noted. Inheritable. Comparable to the disease described by Emerson." (Dept. Pl. Path.) Also reported from Kansas.

Variegation disease, or streak, occurs in South Africa (1). It is infectious, but neither bacteria or fungi are responsible. The disease is similar to mosaic but has a different insect carrier, a jassid leafhopper of the genus Balclutha, which has failed to transmit mosaic in infection experiments. Aphis maidis, the known carrier of the mosaic disease, has also failed to transmit the variegation disease, so that the theory that the two maladies are the same is untenable.

Recent literature on miscellaneous corn diseases:

1. Anon. The variegation disease of maize: preliminary investigations. Jour. Dept. Agr. South Africa 9: 194-195. Sept. 1924.
2. Drechsler, Charles. Leafspot of maize, a disease distinct from leafblight. Phytopath. 15: 47. Jan. 1925.
3. Marquez, S. Leafblight of corn. Philippine Agr. 12: 453-458. Mar. 1924.
4. Reddy, C. S. and J. R. Holbert. The blackbundle disease of corn. Jour. Agr. Res. 27: 177-206. 1924.
5. Storey, H. H. A disease of maize and its probably relation to the control of streak disease in Uba cane. South African Sugar Jour. 8: 647,649. Sept. 1924.

RICE

Blast, Piricularia grisea (Cke.) Sacc. Traces were reported from Arkansas and Texas.

Straighthead, non-parasitic. In Arkansas the season was apparently too dry to allow sufficient irrigation to cause straighthead. (V. H. Young) In Texas Taubenhaus reports it as prevalent, but only causing 1% damage.

Blight, Helminthosporium oryzae van Bredade Haan, causing injury to young plants in Florida.

Leafspot associated with Helminthosporium spp. was reported from Porto Rico and Arkansas.

Footrot due to Ophiobolus sp.? was reported from Arkansas as follows:

> "For several years Ophiobolus has been associated with rotted bases of stems and rotted roots. To be published shortly." (Dept. Pl. Path.)

Stemrot, Sclerotium oryzae Cat. caused a loss of 1% in Arkansas. All important varieties were attacked. One case of a loss of 50% of an 80 acre field was observed. (V. H. Young)

Recent literature:

Copeland, E. B. Rice. Macmillan 1924. Diseases and pests p. 52-100.
Kasai, M. Cultural studies with Gibberella saubinetii (Mont.) Sacc. which is parasitic on rice-plant. Ber. Ohara Inst. Landw. Forsch. 21: 259-272. 1923.
Ocfemia, G. O. The Helminthosporium disease of rice occurring in the southern United States and in the Philippines. Amer. Jour. Bot. 11: 385-408. June 1924.
_______________ The relation of soil temperature to germination of certain Philippine upland and lowland varieties of rice and infection by the Helminthosporium disease. Amer. Jour. Bot. 11: 437-460. July 1924.

FLAX

WILT CAUSED BY FUSARIUM LINI BOLLEY

Wilt was serious in North Dakota where it caused 10% damage. This seems to be close to the average annual loss in North Dakota. In Minnesota there was a loss of 2%, while in Wisconsin there was less than usual and the loss was only a trace. The disease was reported from Montana also.

North Dakota: General on lands previously planted to flax, particularly in eastern half of state. Too cool for best development. Wilt resistant seed in demand due to increased acreage. Not sufficient available so that more wilt resulted. (Brentzel)

Minnesota: Reports 2% loss, the maximum percentage of wilt found in any field was 85%. The disease was general. Abundant rainfall and low temperatures no doubt prevented much wilt damage. (Sect. Pl. Path.)

Recent literature:

Barker, H. D. A study of wilt resistance in flax. Minnesota Agr. Exp. Sta. Tech. Bul. 20: 1-42. Nov. 1923.
Reynolds, E. S. Some relations of Fusarium lini and potassium cyanide. Amer. Jour. Bot. 11: 215-217. 1924.
Stoa, T. E. and A. C. Dillman. Flaxseed production. North Dakota Agr. Exp. Sta. Bul. 178: 1-43. Apr. 1924. Wilt disease, p. 11-19.

RUST CAUSED BY MELAMPSORA LINI (SCHUM.) DESM.

Wisconsin: Fairly prevalent but no reduction in yield. (Vaughan)

Minnesota: More abundant than last year. One percent loss. Causes reduction in yield in heavily infested fields. (Sect. Pl. Path.)

North Dakota: More prevalent than last year and more than average. More general this year than the average range of distribution. First observed at Fargo, July 11. (Brentzel)

South Dakota: About the same amount of rust as last year. A trace of damage. Sixty percent of fields showed infection. (Evans)

Recent literature:

Hart, Helen. Factors affecting the development of Melampsora lini (Pers.) Desm. (Abstract) Phytopath. 15: 53-54. Jan. 1925.
Henry, A. W. and E. C. Stakman. The control of flax rust. (Abstract) Phytopath. 15: 53. Jan. 1925.

PASMO CAUSED BY PHLYCTAENA LINICOLA SPEG.

South Dakota is a new state reporting the occurrence of pasmo. According to Evans it has done a lot of damage to a number of fields. It was especially severe on the experimental plots. Minnesota reported more than last year.

North Dakota: Less severe than usual. Maximum infection found in any field 100%. General over the state. Found June 20, at Fargo. Some varieties much more resistant than others. Life history being worked on. (Brentzel)

OTHER DISEASES AND INJURIES

Colletotrichum linicolum Peth. & Laf. Anthracnose has not been observed to occur for many years in North Dakota. In Wisconsin it was more prevalent than last year and more than average, while Minnesota reports more than last year but no damage is recorded.

Hail injury in Michigan is said to have produced galls as a result of bruising.

Heat canker, non-parasitic. North Dakota reported 3% loss from this disease, South Dakota 1%, and Montana "abundant injury."

Rhizoctonia sp. on flax roots was reported as doing slight injury to some plants in Minnesota. Specimens collected June 24 in Wilkin County.

Recent literature:

Hiura, M. On the flax anthracnose and its causal fungus, Colletotrichum lini (Westerdijk) Tochinai. Japanese Jour. Bot. 2: 113-132. Nov. 1924.

Schoevers, T. A. C. Some preliminary experiments for disinfecting flaxseed carrying Botrytis disease. Rep. Int. Conf. Phytopath. & Econ. Entom. Holland 1923: 116-117. 1923.

SORGHUM

COVERED KERNEL SMUT CAUSED BY SPHACELOTHECA SORGHI (LK.) CLINT.

This is the most common and destructive disease attacking the sorghums. It was less prevalent than in 1923, however. Kansas reports 2.5%, North Dakota and Texas 1%, Minnesota trace.

Studies in Kansas indicate that soil temperatures are less important for infection than moisture relationships. Infection has been obtained over a very great range of soil temperatures.

KERNEL SMUT OF MILO, FETERITA, AND DWARF HEGARI

Extensive studies in Kansas, Missouri, New York and Washington, D. C., during the last seven years have shown that several varieties of sorghum have been consistently immune to all three sorghum smuts occurring in the United States. Three varieties of special interest are Milo, Feterita, and Dwarf Hegari. Recently, however, these varieties have become infected by kernel smut. Specimens of smut on all three have been collected in Kansas, Texas, and New Mexico. Reports from these three states came in to the Office of Cereal Investigations of the Bureau of Plant Industry and to the Kansas Station simultaneously. There are indications that this smut has been present in the southern states for several years. It has assumed an alarming condition in Texas where the acreage of Dwarf Milo is very large and the crop important.

The smut on these varieties appears to be a physiologic strain of one of the kernel smuts, the exact identity of which is being determined. Host hybridity is not an explanation of this peculiar condition. Investigations are being conducted cooperatively by W. H. Tisdale of the Cereal Office and L. E. Melchers and C. O. Johnston of the Kansas Station. The nature of the organism, susceptibility of hitherto resistant varieties, and control measures are being studied.

The report of the occurrence of head smut on yellow milo in Kansas, recorded in Plant Disease Reporter, Supplement 35, page 297 is an error. This should have been the kernel smut. (Melchers)

OTHER DISEASES

Bacillus sorghi Burr. Blight was reported as producing a trace of injury from Kansas, Arkansas, Texas and Minnesota. Iowa reports 2% loss.

Colletotrichum falcatum Went. Anthracnose was reported from Mississippi by Neal and Wallace as causing a trace of damage.

Puccinia purpurea Cke., rust, Florida and Kansas.

Sorosporium reilianum (Kuehn) McAlp. In Kansas head smut occurs in scattered fields in small amounts. Red Amber seems to be one of the most susceptible sorghums. A loss of 1% was reported from Minnesota, where the maximum infection observed was 30%. Traces were observed in 1924 in Texas, Oklahoma, and New Mexico by Melchers and Tisdale. It probably occurred in small quantities in most of the states growing sorghums.

Sphacelotheca cruenta (Kuehn) Potter - The only report of the occurrence of loose kernel smut was from Texas where it caused 1% loss.

Recent literature on sorghum diseases:

Faris, J. A. Modes of infection of sorghums by loose kernel smut. Mycologia 17: 51-67. Mar. - Apr. 1925.
Kulkarni, G. S. Resistance of sorghum to loose and covered smuts. Phytopath. 14: 288. June 1924.
Melchers, L. E., and G. M. Reed. Sorghum smuts and varietal resistance in sorghums. U. S. Dept. Agr. Bul. 1284. 1925.
Reed, G. M., and J. A. Faris. Influence of environmental factors on the infection of sorghums and oats by smuts. I. Experiments with covered and loose kernel smuts of sorghum. Amer. Jour. Bot. 11: 518-534. Oct. 1924.

SUDAN GRASS

Kernel smut caused by Sphacelotheca sp. occurred in Colorado. Although the species was not determined it was probably S. sorghi, which was also rather common in Kansas.

DISEASES OF FORAGE CROPS

A. LEGUMES

ALFALFA

LEAFSPOT CAUSED BY PSEUDOPEZIZA MEDICAGINIS (LIB.) SACC.

The following estimates of losses indicate that this particular leafspot was no more serious than frequently occurs. All sections of the United States seem to be included.

Alfalfa - Leafspot

Table 54. Estimates of losses caused by leafspot, 1924.

Percentage loss	State
7	Maryland
5	New Mexico
4	Illinois
2	Iowa
trace - 1	New York
.5	Ohio
0	Wisconsin, Colorado

Other states reporting the occurrence are New Jersey, Texas, Michigan, Minnesota, North Dakota, South Dakota and Idaho, but the injury was in most cases of minor significance.

Delaware: Heavy infection generally observed. Severe defoliation where cutting of first crop was delayed. (Adams)

Wisconsin: Very little evidence of leafspot where there is a plentiful supply of available lime. (Vaughan)

Minnesota: Very heavy infections reported about the middle of July from Hennepin, Stearns and Wright Counties. (Sect. Pl. Path.)

North Dakota: Much more than last year; common and destructive. Very severe on second cutting or on fields saved for seed production. Difficult to estimate loss. (Weniger)

Idaho: Found throughout the state, but not as common as the yellow leafblotch nor as destructive. (Hungerford)

YELLOW LEAFBLOTCH CAUSED BY PYRENOPEZIZA MEDICAGINIS FCKL.

Yellow leafblotch was scarecely to be found in the United States, at least in amounts sufficient to cause any appreciable damage. Only traces were noticed in a few fields in New York, Illinois, Wisconsin, Iowa, and Idaho.

Idaho: Usually causes considerable dropping of leaves of the first crop and necessitates early cutting. (Hungerford)

Kansas: Entirely absent from the first crop which is the one chiefly attacked. The cool spring followed by dry weather is believed to have been a factor in preventing infection and spread. (Melchers)

DOWNY MILDEW CAUSED BY PERONOSPORA TRIFOLIORUM D BY.

In 1924 downy mildew seemed confined mostly to the Central States, the only state in the East reporting its occurrence being Connecticut, where it was observed for the first time, according to Clinton. In the West it was reported from Idaho. In all instances it caused only a trace of injury, except in Iowa where Porter reports 2% loss. The other states reporting it were Illinois, Kansas, Colorado, Indiana, Wisconsin, and Minnesota.

Statements by collaborators:

Connecticut: Downy mildew on alfalfa found for the first time in the state. No serious damage resulted as dry weather prevented spread. (Clinton)

Illinois: This is an unusual outbreak. We rarely find this disease in Illinois. (Tehon)

Wisconsin: Downy mildew has been reported quite prevalent this spring on alfalfa. First noted May 15 on sweet clover. It was especially noticeable June 5 where plants were weakened by winter injury. (Vaughan)

Iowa: Unusually prevalent. Defoliation resulted. (Porter)

Colorado: This disease was more common than leafspot. Most fields showed trace in survey made in June. (Learn)

ALFALFA NEMATODE (TYLENCHUS DIPSACI (KUEHN) BAST.)

During 1924 the known geographic range of Tylenchus dipsaci was widened by the addition of three more states, Idaho, Utah and New Mexico, and by its being found in many new counties in Colorado. In 1923 it was found in two Colorado counties. Commencing in May 1924 many complaints from that state were received. The situation appeared so serious that a field survey for the purpose of gathering further information concerning the disease was conducted by the Plant Disease Survey, cooperating with the Colorado Station, with the result that the nematode has now been found to be present in sixteen counties, for the most part in the southern portion of the state. In all cases specimens were taken and sent to Washington where the determination was verified by microscopic examination. Other serious alfalfa trouble not attributable to nematode was found especially in Weld County and in eastern Colorado. The cause or causes of this trouble, which takes the form of a rot at the base of the crown, have not been determined (See report in this section on dying of alfalfa.)

The present known distribution of the alfalfa nematode is shown on the accompanying map and details concerning the situation in Colorado and the three new states have been given previously (Plant Disease Reporter 8: 3, 17, 78, and 128. 1924.) No new information is at hand concerning the disease in the Pacific Coast States.

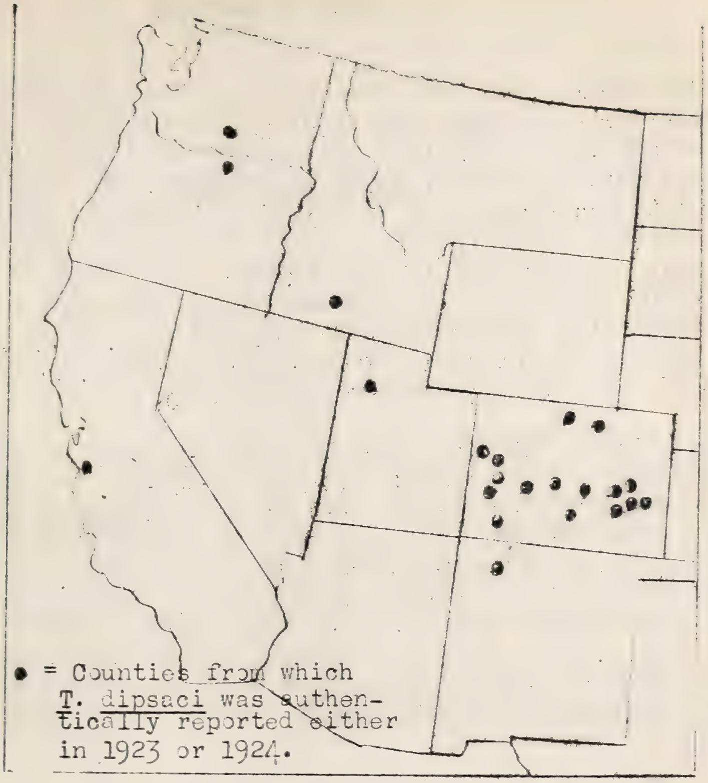


Fig. 3. Present known distribution of the alfalfa nematode, Tylenchus dipsaci, according to records of the Plant Disease Survey.

Recent literature:

Godfrey, G. H., and M. B. McKay. The stem nematode Tylenchus dipsaci on wild hosts in the Northwest. U. S. Dept. Agr. Bul. 1229: 1-9. Mar. 1924.

____________ Dissemination of the stem and bulb infesting composites. Jour. Agr. Res. 28: 473-478. 1-3. May 3, 1924.

BACTERIAL BLIGHT CAUSED BY BACTERIUM MEDICAGINIS (SACK.) EFS.

Bacterial blight was reported as occurring in Nebraska, Idaho, and Washington, but did practically no damage. It is interesting to note that in Nebraska it was only observed in irrigated regions. This necessarily holds for Washington and Idaho also, therefore, it would be of interest to learn whether this disease is confined chiefly to irrigated sections. Records for the last four years indicate that this is true.

DYING OF ALFALFA

Commencing in May 1924 numerous reports concerning the dying of alfalfa were received from some of the western states, particularly Colorado and Wyoming. At first it was suspected that this dying might be due to the alfalfa nematode, Tylenchus dipsaci, which upon investigation was found to occur frequently in Colorado. However, field observations and examinations of material from parts of Colorado where the disease was most serious, particularly in Weld County, by persons in the Bureau of Plant Industry and at the Colorado Experiment Station, failed to show the nematode associated constantly with the disease. Dr. Gerald Thorne was detailed to make a study of the Colorado conditions, and concerning the situation in Weld County he wrote on July 10:

> "Apparently the nemas are not the cause of the most seriously damaged fields (in Weld County). Ine one of the very worst I have been unable to find Tylenchus dipsaci, even after careful soil washings and careful examination of plants in all stages from dead to healthy. In others the Tylenchi are very scarce and hard to find. When they do appear, the stems have the bases infested and easily pull off, being black and decayed in the basal portions. This condition is not present in hundreds of plants that I have examined from fields where 70-80% of the plants are dead."

However, from another section of the state he reported that,

> "Out of 62 fields which I have examined the last two days in the vicinity of Fort Collins and Windsor, I have found almost 50 to be definitely infested with Tylenchus dipsaci, and in practically all the rest there were probably infested plants in which I was unable to definitely locate the pest. In some sections there is probably 100% infestation.
>
> "One 65 acre field did not have an acre on which I failed to find the nema, much of it being infested on every square rod. The oldest portion of it, 5 and 6 years, must be plowed up as about 60% of the plants are dead. In the portion just in its third season a few are beginning to die and many show some of the injury."

The symptoms of the disease as it occurs in Colorado and Wyoming have been given as follows by Director C. P. Gillette of the Colorado Experiment Station, June 17.

> "Sometimes the entire top growth is wilted down as if from lack of water, and at other times only a portion of the plant. Often the plant does not make more than three or four inches of growth before the top wilts and later turns brown, while in other cases the plants may grow to a foot or more in height and then dry up and die with plants all about them in a perfectly healthy and vigorous condition.

> "All of these dying or dead plants seem to be diseased in the crown or immediately beneath the crown in the upper part of the tap root, which ultimately is entirely decayed and will readily break off. In plants that show but little of the wilt, the lower root seems practically sound and healthy, but on removing the bark next the crown the cambium is brown and soggy, indicating to me that there is a plant disease organism present. As the disease advances the root for some distance down turns brown also.
>
> "There are various theories among the farmers. Some think the trouble due to spring freezing; others to the application of too much water. Some think the plants have not received water enough, still others think that it is due to the age of the plants. My attention was also called to soil conditions, where light or heavy soil or an excess of sodium nitrate which causes so much trouble in the growth of some of our crops, but I find no reason to think that any of these possible causes are worthy of much consideration in the dying of the alfalfa. I have not yet seen a single plant showing the characteristic swellings that are supposed to be produced by the true alfalfa eelworm."

A number of specialists, including agronomists and pathologists from the Department of Agriculture and from the states of Colorado and Wyoming, have observed the trouble and concur in the belief that it is not due primarily to nematodes nor is it especially an agronomic problem but are of the opinion that it is a disease of fungous or bacterial origin.

In Kansas also many alfalfa fields showed poor stands and both bacteria and fungi were found associated with the trouble. According to Melchers it has been becoming increasingly conspicuous during the last three years.

Recent literature:

Headden, W. P. The alfalfa "failure." Through the Leaves 12: 551-552. Nov. 1924.

ROOTROTS DUE TO VARIOUS CAUSES

Rootrots associated with Fusarium spp. Kentucky, Illinois, Montana, and Idaho have reported a root and crownrot associated with Fusarium sp. While no definite statements are made in the reports, this disease probably attacks individual plants rather than large numbers in definite areas or spots as in the case of the violet rootrot.

Ozonium omnivorum Shear. In western Texas alfalfa grown under irrigation is seriously affected with rootrot. The estimated loss for the state has been placed at 10%. It is very prevalent in the Rio Grande Valley. (Taubenhus) Streets estimated a loss of 3% in Arizona.

Violet rootrot caused by Rhizoctonia crocorum (Pers.) DC. (Rhizoctonia violacea Tul.) This disease proved to be somewhat prevalent in Kansas. In Iowa it caused damage locally. It was also reported from Michigan and Minnesota.

Alfalfa - Rootrots

A careful review of the history and occurrence of this disease shows that in this county it has most consistently occurred in the group of states including Kansas, Nebraska, and Iowa. From the records available, it is evident that violet rootrot has caused the greatest loss in Kansas over a series of years.

Buddin and Wakefield (1), in an article describing the growth in pure culture of the organism, which they state should be known as R. crocorum, suggest that the relatively high optimum temperature, about 25.5°C., obtained in their experiments may explain the geographic distribution of the fungus in the field. It occurs mostly in rather dry localities where soil temperatures would be comparatively high. The strain with which they were working was isolated from red clover roots, but inoculation experiments showed that it was capable of causing complete decay of the roots and death of young carrot plants.

Sclerotinia trifoliorum Eriks. Stemrot was apparently inconspicuous the past year. Idaho, Kentucky, and Washington reported it merely as having been observed.

Recent literature:

Cited:

1. Buddin, W., and E. M. Wakefield. Some observations on the growth of Rhizoctonia crocorum (Pers.) DC. in pure culture. Annals Appl. Biol. 11: 292-309. Oct. 1924.

OTHER DISEASES AND INJURIES

Ascochyta imperfecta Pk. This leafspot was widely distributed in Illinois, being more prevalent than usual and causing a trace of injury.

Cercospora medicaginis Ell. & Ev. This leafspot was reported from Illinois and Texas as occurring in traces.

Colletotrichum trifolii Bain. The only report of anthracnose received was from Illinois where it was serious in a 45 acre field in Alexander County. (Tehon)

Cuscuta sp. In New Mexico Crawford says dodder has been damaging the alfalfa crop to an extent of 4%. It has been known to occur in Kansas for many years. In the past season several definite inquiries concerning it came to the Agricultural College.

Heterodera radicicola (Greef) Muell. Rootknot is important in Texas where the hairy Peruvian variety is not grown. (Taubenhaus)

Leafspots (in general). The various common leafspots of alfalfa were said to be very much less conspicuous in Louisiana and Kansas than usual.

Macrosporium sarcinaeforme Cav. Illinois reported this leafspot for the first time to the Survey.

Pleosphaerulina briosiana Poll. Said to be widely distributed in Illinois on alfalfa, causing a trace of damage. This is the first report to the Plant Disease Survey from Illinois.

Uromyces medicaginis Pass. Rust was observed in Iowa, Wisconsin, Ohio, and Texas and probably several other states. In no instance did it cause any appreciable injury, except perhaps in a few cases one of the crops may have suffered slightly. In Kansas it generally occurs on the last crop just before cutting.

Urophlyctis alfalfae (Lagh.) Magn. The only report of crownwart received was from Utah, where it is dais to be widespread, and it is believed to be more important than the alfalfa nematode. It was found in Salt Lake, Uinta, Utah, Davis, Boxelder, Weber, and Morgan Counties according to Richards.

White top or *yellows*, (non-parasitic) was reported from Washington, Montana, and North Dakota. In Montana it was prevalent over the state.

CLOVER

ANTHRACNOSE CAUSED BY COLLETOTRICHUM TRIFOLII BAIN

This disease was reported from Kentucky, Mississippi, Texas, Indiana, Wisconsin and Idaho. In no instance was it said to be doing any noticeable injury.

Wisconsin: On varietal plots at Branch Experiment Station found some on all varieties. (Vaughan)

Indiana: Found by A. G. Johnson to be serious on Italian varieties. (Gardner)

Kentucky: This disease observed on several occasions but in no case was it very serious. (Valleau)

A report of interest on this disease is one by Pieters (1) as follows:

> "In using the term disease factor, reference is made especially to the anthracnose caused by *Colletotrichum trifolii*, which, as is well known, has been so disastrous to clover culture in Tennewsee and which was studied especially by Bain and Essary. This disease has been quite serious on the clover plots at the Arlington Farm, where tne disease destroyed nearly or quite 100% of the stand on the plots sown to Italian and German seed and made very heavy inroads on the stand of the plots sown to Bohemian, English, French, and Polish seed. Plots seeded to Chilean seed also suffered, but not nearly as much as the other plots. Plots seeded to Oregon seed lost more than 90% of the stand and plots seeded to Idaho and Minnesota seed also suffered to a certain extent. The only plots which showed approximately no injury were those seeded to the Tennessee disease-resistant strain and to some seed purchased in southwestern Ohio, the exact origin of which is not known beyond the fact that it was Ohio grown.
>
> "How far this disease is responsible for the loss of stands of red clover is not known, but there is considerable evidence to indicate that this factor is much more important in the states south of the Ohio than has been suspected. Whatever the facts may be in this regard, it is quite evident

that there is a considerable difference in susceptibility between various strains, and that the Italian strain is particularly susceptible to this disease." (A. J. Pieters)

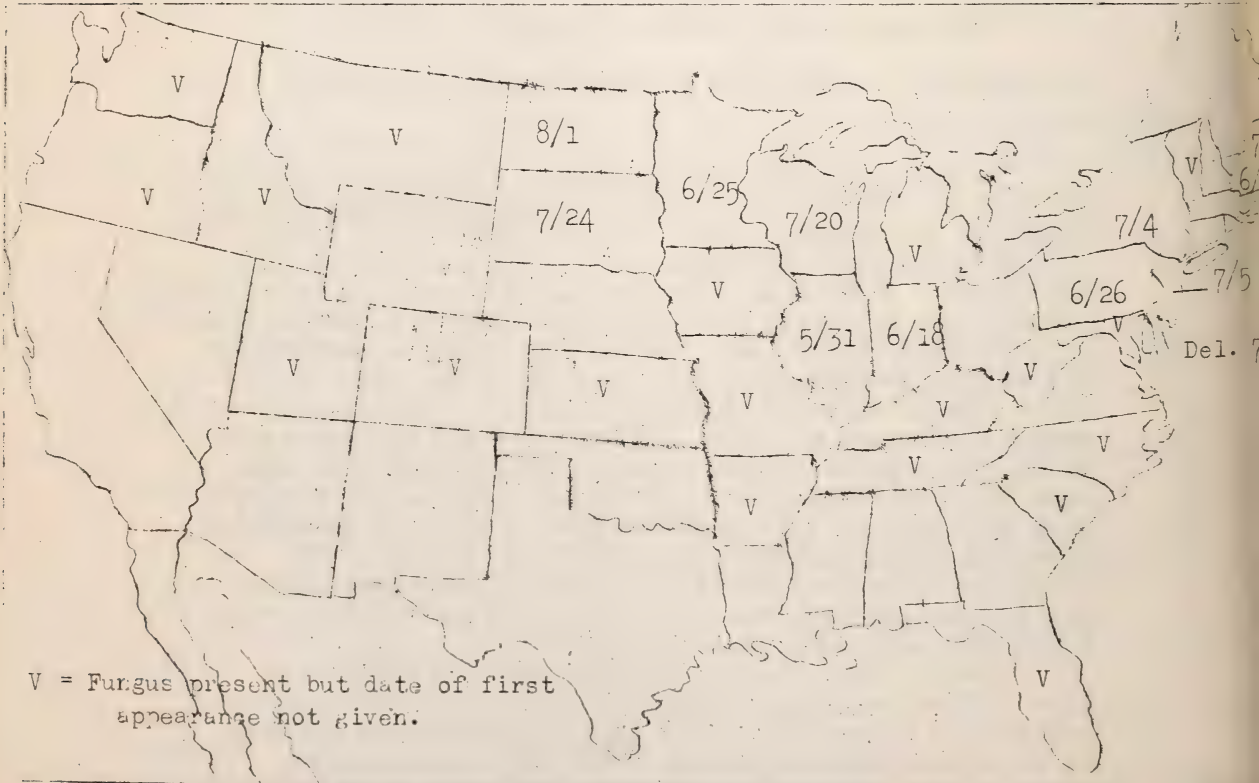
Recent literature:

Cited:

1. Symposium - The forage problem. Jour. Amer. Soc. Agron. 16: 153-238. Mar. 1924.

POWDERY MILDEW CAUSED BY ERYSIPHE POLYGONI DC.

Powdery mildew was apparently as widespread as in the last two years, although several states growing clover did not report. For the United States as a whole it would appear as though powdery mildew was not as abundant. It is interesting to note how the severity of powdery mildew has fluctuated since 1921. In that year there was a sudden outbreak. In 1922 it was worse and more widespread over the United States. In 1923 there was less over the country as a whole except perhaps in the Northeast where it remained about the same. In 1924 there seemed to be somewhat less in some states, more in others, and approximately the same in the remainder. The distribution and dates of earliest appearance are shown in the map, (fig. 4.)



V = Fungus present but date of first appearance not given.

Fig. 4. Occurrence and dates of first observation of clover powdery mildew in 1924.

Clover - Powdery mildew

A noteworthy feature of the clover powdery mildew situation in 1924 was its greater prevalence in some of the western states, particularly Oregon, Washington, Idaho, Montana, and Utah. A powdery mildew has long been known in the Rocky Mountain Section but not until this year have there been so many complaints and reports. In Oregon it was noted early in August, and seemed to spread out from centers of infection. In Washington it was so abundant in parts of Pend Oreille County that the spores resembled dust clouds at haying time, according to Zundel.

It is possible that the strain of Erysiphe that has been so prevalent in the East during the past four years has now spread to the West. A few of the collaborators' reports follow:

Idaho: Very widespread. Perithecia found only in irrigated section of southern Idaho. (Hungerford)

North Dakota: Appeared later than in 1922 or 1923. Most severe on second cutting. No perithecia found. (Weniger)

Wisconsin: Apparently heavy on second crop. Smooth varieties of foreign clovers are immune. (Vaughan)

Recent literature:

Noffray, E. Le blanc des trefles. Jour. Agr. Prat. 84 (2): 72-75. July 22, 1920. Erysiphe communis.

CLOVER RUST CAUSED BY UROMYCES SPP.

Only in a few instances did collaborators report the kind of clover on which rust was found. Since several species of rust are known to occur on as many different species of Trifolium, there is some chance for doubt as to which rust was meant in the reports.

In a recent article, Davis (1) gives a summary of his investigations on clover rusts:

White clover rust, Uromyces trifolii-repentis (Cast.) Liro, occurrs only on white clover, Trifolium repens L.

Red clover rust, Uromyces trifolii (Hedw. f.) Lév., occurs on red clover, Trifolium pratense L., and zigzag clover, Trifolium medium L.

Alsike clover rust, Uromyces hybridi Davis, occurs on alsike clover, Trifolium hybridum L.

The rusts reported by collaborators this year are as follows: Uromyces fallens (Desm.) Kern. occurred on clover (species not given) in New Jersey, Washington, North Dakota, Wisconsin and Pennsylvania.

Uromyces hybridi Davis, occurred on T. hybridum in New York, Connecticut, and Washington.

Uromyces trifolii (Hedw. f.) Lév. was reported on T. repens from Connecticut, Pennsylvania, New York, New Jersey, and Iowa.

Uromyces sp. was reported feom New Jersey and Maryland.

Recent literature:

Cited:

1. Davis, W. H. Summary of investigations on clover rusts. Mycologia 16: 203-219. Sept. 1924.

ROOTROTS DUE TO VARIOUS CAUSES

Rootrot caused by Sclerotinia trifoliorum Eriks.

Maryland: Crimson clover most susceptible. (Jehle & Temple)

Rootrot associated with Fusarium sp.

Kentucky: A 40% reduction in stand has occurred in Kentucky. It occurs in all fields over the state. (Valleau)

The small rootlets badly rotted, many plants will not withstand drought period. The stand of plants is generally reduced about 80% the first summer, slightly the next winter, and about 90% of the remaining plants are killed the next summer. (Fergus & Valleau)

What seems to be this same trouble is reported from Idaho by Hungerford who states that it is not very important except in isolated cases.

OTHER DISEASES AND INJURIES

Ascochyta imperfecta Pk. An unusual outbreak of this leafspot is reported from Illinois where it caused 1% injury. This is the first report to the Plant Disease Survey. No previous record of this fungus was found on clover.

Bacterium trifoliorum Jones, Williamson, Wolf & McC. Bacterial leafspot was found in Indiana and Wisconsin.

Botrytis sp. Greymold was very prevalent as a marginal infection of lower leaflets in thick stands of crimson clover in Delaware. (Adams)

Cercospora medicaginis Ell. & Ev. Illinois.

Cuscuta sp. No reports of dodder were received in 1924. In an article which should be of interest, Saunders describes a magnetic process used in place of screening for separating dodder seed from clover seed. (Jour. Min. Agr. Great Britain 30: 928-931. 1924.)

Gloeosporium caulivorum Kirch. The only report of anthracnose received came from Illinois. Tehon states the injury is slight except in rare instances.

Hollow crown (undetermined). This condition is said to be very serious where it occurs in Illinois. It was seen in Grundy County early in August. The cause was not apparent according to Tehon.

Mosaic (undetermined). In Indiana it is statewide but not causing any appreciable injury. (Gardner)

Clover - Miscellaneous diseases

Phyllachora trifolii (Pers.) Fckl. Reported from Louisiana, Indiana, Pennsylvania on *T. repens* and New Jersey on *T. hybridum*. Elliott and Stansfield (3) have transferred the fungus to the genus Dothidella.

Pseudopeziza trifolii (Biv.) Fckl. Reported on *T. pratense* from Pennsylvania, Maryland, Wisconsin, Iowa, South Dakota, and Idaho. It was not considered of economic importance by collaborators.

Tylenchus dipsaci (Kuehn) Bast. This nematode is important where it occurs in Idaho; especially common in Twin Falls and in Canyon Counties. (Hungerford)

Recent literature:

1. Bonar, L. Studies on the biology of Brachysporium trifolii. Amer. Jour. Bot. 11: 123-158. 1924.
2. Ciferii, R. Esperienze sulla propagazione della batteriosi fogliare del Trifoglio e sulla lotta mediante la sterilizzazione parziale del suolo. (Experiments in connection with the spread of leaf bacteriosis of clover and on its control by means of partial sterilization of the soil.) Staz. Sperim. Agrar. Ital. 57: 165-177. 1924.
3. Elliott, J. S. and O. P. Stansfield. The life history of Polythrincium trifolii Kunze. Trans. Brit. Mycol. Soc. 9: 218-228. Aug. 1924.
4. Foy, N. R. Dodder in white clover. New magnetic process of removal. New Zealand Jour. Agr. 29: 44-45. July 1924.
5. Pieters, A. J. Clover failure. U. S. Dept. Agr. Farmers' Bul. 1365: 1-24. 1924.
6. ____________. Clover problems. Jour. Amer. Soc. Agron. 16: 178-182. 1924.

SWEET CLOVER

Leafspot, *Ascochyta meliloti* (Trel.) J. J. Davis, caused some blasting of seed in late fields in North Dakota. (Weniger)

Leafspot, *Cercospora davisii* Ell. & Ev., was reported as being present on lowermost leaves of *Melilotus alba* in Illinois and Pennsylvania.

Mosaic (undetermined). Reported as prevalent from South Dakota and somewhat common from North Dakota.

Downy mildew, *Peronospora trifoliorum* D By., was reported from Wisconsin for the first time to the Plant Disease Survey. Vaughan stated that "F. R. Jones has examined the specimens carefully and advises that there is no difference in the fungus on sweet clover and pea. Quite prevalent in the state, the first infection being noted May 15." (Vaughan)

Recent literature:

Newton, Robert and R. R. Brown. Is the apparent winter-killing of sweet clover and red clover a result of disease injury? Scient. Agr. 5: 93-96. Nov. 1924.

COWPEA

BACTERIAL LEAFSPOT CAUSED BY BACTERIUM VIGNAE GARD. & KEND.

Illinois, Kansas, Indiana and Iowa reported bacterial leafspot.

Indiana: Serious on seedlings and pods. Fairly high rainfall favorable. No resistant varieties have been noted. New Era, the variety largely grown in southern Indiana, is very susceptible and was generally infected. Infection has been obtained on velvet bean and the disease has been found on *Desmodium canescens*. (Gardner)

Kansas: Has been common some seasons for several years. (Melchers)

Illinois: Caused leaves to shed badly on white cowpeas in vicinity of Quincy, Illinois. (Tisdale)

OTHER DISEASES AND INJURIES

Leafspot, *Amerosporium oeconomicum* Ell. & Tr., was found on New Era in southern Indiana according to Gardner. Adams of Delaware observed that wet weather in September was favorable for its spread.

Leafspot, *Cercospora cruenta* Sacc., New Jersey, Delaware, Florida, Texas, Indiana, Illinois, Porto Rico reported it as common. In Indiana Gardner reports it in variety plots. This disease was serious on the Blackeye and Early Buff varieties. It was present on Whippoorwill; absent on Iron, Groit, New Era, Early Red and Catjang.

Chlorosis, due to excess of lime. Taubenhaus of Texas reports such a condition.

Powdery mildew caused by *Erysiphe polygoni* DC.

Florida: Very severe in a field at Plant City. Eighty percent of the leaves were overgrown. Not found elsewhere. (Weber)

South Carolina: Common in the northwest but doubtless general. Over 60% of the plants in the state affected. One percent reduction in yield. (Ludwig)

Very severe throughout Coastal Section. Some fields partially defoliated. (Moore)

Stemrot, *Fusarium vasinfectum tracheiphilum* EFS., caused a loss of 2% in Texas, and was reported from Virginia, South Carolina, and Indiana. (*Indiana*: noted on new Era variety. Disease serious locally.(Gardner

Anthracnose, *Glomerella lindemuthianum* Shear. - A specimen was sent in from Waldo, Florida, where it was attacking the seed pods of the host plant. The disease is not common, however. (Weber)

Rootknot, *Heterodera radicicola* (Greef) Muell. In Florida, Brabham and Iron cowpeas are resistant; the former is practically immune.

Mosaic (undetermined). Moderate in some localities in Louisiana.

Cowpea - Miscellaneous diseases

Rootrot, Ozonium omnivorum Shear, caused a 2% reduction in yield in Texas; less important than in 1923 on account of dry season. (Taubenhaus)

Leafspot, Phyllosticta phaseolina Sacc. Reports received from Illinois and Delaware. Said to be causing a trace of damage.

Podspot (fungs? undetermined). Manns and Adams report a disease of soybeans and cowpeas which attacks the pods.

Crown and rootrot associated with Rhizoctonia sp. Serious locally in Indiana, attacking young plants. Wet weather favorable. On New Era 25% of plants were dying in one field. (Gregory & Gardner)

Rust, Uromyces vignae Barclay, caused a loss of 3% in Texas. (Taubenhaus) According to Fromme (2) rust of cowpea, which has formerly been reported as U. appendiculatus (Pers.) Fr., is a distinct species, and has been recorded from Maryland, Virginia, Florida, Alabama, Texas, Indiana, Iowa, Missouri and California in the United States.

Recent literature:

1. Anon. Nematode resistant varieties of cowpeas. Florida Grow. 29: 9. Jan. 1924.
2. Fromme, F. O. The rust of cowpeas. Phytopath. 14: 67-69. 1924.
3. Smith, C. E. Transmission of cowpea mosaic by the bean leaf beetle. Science 60: 268. Sept. 19, 1924.

SOYBEAN

Leafspot associated with Alternaria sp. A bad infection occurred in Clay County, Illinois. Some other thing may have been the primary cause. (Tehon)

Bacterial spot (undetermined). A bacterial spot which seems to resemble Bacterium phaseoli sojense Hedges was reported from Louisiana and Maryland, but the records do not state specifically what the organism is.

Bacterial blight, Bacterium glycineum Coerper, was reported from Mississippi for the first time. It appears to be common in Indiana and Illinois.

Bacterial pustule, Bacterium phaseoli sojense Hedges, is known to occur in Delaware, Virginia, South Carolina, Louisiana, Texas, Arkansas, and Kansas (1).

Leafspot, Cercospora sp. Found in one field in South Carolina.

Pod and stemblight, Diaporthe sojae Lehman; a few plants were found in a field in Cass County, Indiana, by Gardner.

Mosaic (undetermined).

Indiana: Not common in the commercial crop. The variety now commonly grown, the Manchu, is not as susceptible as Midwest, the variety formerly predominating. (Gardner)

Delaware: This disease is said to have appeared in various parts of the state and in some instances the presence of woolly aphis is thought to have been associated with the disease. (Manns & Adams)

Downy mildew caused by Peronospora sojae Lehman & Wolf was described from North Carolina (3). Reports and specimens were received from collaborators in Delaware and Kentucky.

Podspot, Phomopsis sp. Thought to be perhaps the same as Diaporthe sojae Lehman (Phomopsis sojae Lehman) recently described and reported from North Carolina. Reported from Delaware.

Stemrot, Rhizoctonia solani Kuehn, was serious locally in Indiana in early season. Plants were killed by infection at surface of soil. High rainfall and cool weather were favorable to the disease. (Gardner)

Stemrot, Sclerotium rolfsii Sacc., was found in Mississippi for the first time on cowpea, and caused a loss of 10%. Data on the amount of infection on four varieties gave the following averages, taken from three plots where all the varieties were growing: Laredo, 22+%; Biolox, 25+%; Ootatan, 17%; and Mammoth Yellow, 21%. (Neal & Barker)

Leafspot, Septoria glycines T. Hemmi (?), seems to occur only on seed leaves according to Adams of Delaware. This is the first report to the Plant Disease Survey.

Recent literature:

1. Hedges, Florence. A study of bacterial pustule of soybean, and a comparison of Bacterium phaseoli sojense Hedges with Bacterium phaseoli EFS. Jour. Agr. Res. 29: 229-251. Sept. 1, 1924.
2. Kendrick, J. B. and M. W. Gardner. Soybean mosaic. Seed transmission and effect on yield. Jour. Agr. Res. 27: 91-98. 1924.
3. Lehman, S. G. and F. A. Wolf. A new downy mildew on soybeans. Jour. Elisha Mitchell Sci. Soc. 34: 164-169. 1924.
4. Wolf, F. A. Bacterial pustule of soybean. Jour. Agr. Res. 29: 57-68. July 15, 1924.
5. Woodworth, C. M. and L. J. Cole. Mottling of soybeans. Jour. Hered. 15: 349-354. Aug. 1924.

VELVET BEAN

Leafspot, Bacterium vignae Gardner & Kendrick; Indiana, produced by inoculation with the organism and natural infection occurred also in rows of velvet beans growing near diseased cowpeas.

Leafblotch, Cercospora stizolobii Syd., causing some defoliation in Florida.

Mosaic (undetermined) occurred in experimental plots in Indiana.

HORSE BEAN

Root and stemrot caused by Rhizoctonia sp., Washington.

B. GRASSES

TIMOTHY

Ergot, *Claviceps purpurea* (Fr.) Tul., Pennsylvania.

Anthracnose, *Colletotrichum graminicolum* (Ces.) Wils., Pennsylvania.

Leafspot, *Heterosporium phlei* Gregory, New York and Pennsylvania.

Take all, *Ophiobolus graminis* Sacc., New York.

Rust, *Puccinia graminis* Pers., was reported from Connecticut, New York, Pennsylvania, Illinois, Minnesota, Iowa, Montana, and Colorado. An epidemic in fall was noted in Minnesota; very little during spring and early fall.

Leafspot, *Scolecotrichum graminis* Fckl., seems to be the most destructive timothy disease in New York where two percent loss was recorded. In Pennsylvania the disease was found in 1924 for the first time. It caused a loss of 1%. Illinois also reports it for the first time.

Leafspot, *Septoria* sp., was observed for the first time in the breeding plots in Pennsylvania. *Septoria* sp. was also recorded from Illinois where it has occurred several seasons, as causing a loss of 1%.

Smut, *Ustilago striaeformis* (West.) Niessl, New York, Pennsylvania, Illinois, Wisconsin, Minnesota, Iowa, North Dakota, and Montana. Pennsylvania reports 0.5% loss, New York 0.2%, and the other states a trace.

Recent literature:

Barker, H. D., and H. K. Hayes. Rust resistance in timothy. Phytopath. 14: 363-371. Aug. 1924.

Davis, W. H. Spore germination of Ustilago striaeformis. Phytopath. 14: 251-267. June 1924.

MISCELLANEOUS GRASSES *

Bacterium coronafaciens atropurpureum Reddy & Godkin
- °Avena barbata - Kansas
- °Avena fatua - Kansas
- °Avena sterilis - Kansas
- Bromus sp. - North Dakota, **South Dakota (specimen determined by A. G. Johnson)

Claviceps purpurea (Fr.) Tul.
- Agropyron repens - Pennsylvania, Iowa
- Avena sativa - **Kansas
- Bromus inermis - Iowa
- Bromus sp. - North Dakota
- Festuca elatior - Pennsylvania
- Lolium sp. - Washington
- Phalaris arundinacea - Pennsylvania

Colletotrichum graminicolum (Ces.) Wils. - from Pennsylvania, on
- °Agropyron repens
- °Agrostis palustris
- °Anthoxanthum odoratum
- Bromus secalinus

---

*NOTE: A large number of reports of fungi on grasses are included from Kansas and Pennsylvania, by C. O. Johnston and R. S. Kirby, respectively.

° = First report to Survey

** = First report from state

Miscellaneous grasses

- Dactylis glomerata
- Festuca rubra
- °Hordeum jubatum
- °Lolium perenne
- Notholcus lanatus

Colletotrichum sp.
  - Holcus halepensis - Missouri

Dothichloe atramentosa (Berk. & Curt.) Atk.
  - Lawn grass - southern Georgia

Erysiphe graminis DC.
  - Agropyron repens - Pennsylvania
  - Dactylis glomerata - Pennsylvania
  - Elymus canadensis - Pennsylvania
  - Hordeum jubatum - Mississippi
  - Poa sp. - Washington, Iowa
  - Poa compressa - Minnesota
  - Poa pratensis - Pennsylvania

Gibberella sp.
  - Lolium perenne - Pennsylvania

Helminthosporium sp.
  - Dactylis glomerata - Pennsylvania

Helminthosporium bromi Died.
  - Bromus inermis - Pennsylvania, Iowa

Helminthosporium dictyoides Drechs.
  - Festuca elatior - Pennsylvania

Helminthosporium giganteum Heald & Wolf
  - Elymus virginicus - Pennsylvania

Helminthosporium gramineum Rabh.
  - Pennisetum glaucum (pearl millet) Florida

Helminthosporium sativum Pam., King, & Bak.
  - Elymus canadensis - Pennsylvania

Helminthosporium vagans Drechs.
  - Poa pratensis - Pennsylvania

Leptosphaeria sp.
  - Agrostis palustris - **Pennsylvania

Leptosphaeria culmorum Auer.
  - Lolium perenne - **Pennsylvania

Phyllachora graminis (Pers.) Fckl.
  - Agropyron repens - Pennsylvania
  - Bouteloua curtipendula -**Kansas
  - Elymus canadensis - Pennsylvania
  - °Panicum virgatum - Kansas
  - °Paspalum setaceum - Kansas

Phyllosticta sp.
  - °Agropyron repens - Pennsylvania

Physarum cinereum (Batsch) Pers.
  - Poa pratensis - Pennsylvania
  - Stenotaphrum secundatum - Florida

Piricularia grisea (Cke.) Sacc.
  - Chaetochloa italica (millet) - Illinois
  - Panicum sp. - Illinois
  - Syntherisma sanguinalis - Florida, **Kansas

Puccinia amphigena Diet.
  - Calamovilfa longifolia - Kansas

Puccinia andropogi Schw.
  - Andropogon furcatus - Kansas
  - Andropogon scoparius - Kansas

Puccinia chloridis Speg.
  - Chloris verticillata - Kansas

Puccinia coronata Cda.
  - Avena barbata - Kansas
  - Avena fatua - Kansas
  - Avena sterilis ludoviciana - Kansas
  - Festuca elatior - Pennsylvania, Missouri
  - Notholcus lanatus - Pennsylvania

Puccinia emaculata Schw. (*P. graminis brevicarpa* Pk.)
  - Panicum capillare - Pennsylvania

Puccinia epiphylla Wetts. (*P. poarum* Niessl)
  - Poa pratensis - Pennsylvania

Puccinia glumarum (Schm.) Eriks. & Henn.
  - Hordeum jubatum - Montana

Puccinia graminis Pers.
  - Agropyron repens - Pennsylvania, Wisconsin
  - Agropyron smithii - Kansas
  - Agropyron violaceum - Kansas
  - Agrostis palustris - Connecticut, Pennsylvania, Wisconsin, Iowa
  - Chaetochloa sp. - Illinois
  - Dactylis glomerata - Pennsylvania
  - Elymus canadensis - Pennsylvania
  - Festuca elatior - Pennsylvania
  - Hordeum jubatum - Pennsylvania, Wisconsin, Iowa, Kansas
  - Hordeum pusillum - Kansas
  - Poa compressa - Pennsylvania

Puccinia graminis poae Eriks. & Henn.

°Reported by Stakman and Levine (9) on Poa compressa in 1922 and 1923 in Michigan and 1923 in

Miscellaneous grasses

Indiana. No previous records
Puccinia hibisciata (Schw.) Kell.
(P. muhlenbergiae Arth. & Holw.)
Muhlenbergia schreberi - Pennsylvania
Puccinia montanensis Ell.
Elymus virginicus - Kansas
Puccinia spegazzinii DeToni (P. australis Speg.)
Mikania scandens - Florida
Puccinia sydowiana Diet.
Sporobolus asper - Kansas
Puccinia triticina Eriks.
°Aegilops cylindrica - Kansas
Agropyron repens - Pennsylvania
Elymus canadensis - Pennsylvania
Puccinia windsoriae Schw.
Triodia flava - Kansas
Sclerospora graminicola (Sacc.) Schroet.
Chaetochloa magna - Florida
Chaetochloa viridis - Pennsylvania, Iowa
Scolecotrichum graminis Fckl.
Agrostis palustris - Pennsylvania
Arrhenatherum elatius - Pennsylvania
Dactylis glomerata - Pennsylvania
Poa pratensis - Pennsylvania
Reported on several grasses from South Dakota
Septoria sp.
Poa pratensis - Pennsylvania
Sorosporium syntherismae (Pk.) Farl.
Panicum sp. - New Jersey, Pennsylvania
Urocystis agropyri (Preuss) Schroet.
Agropyron repens - Pennsylvania, New York
Uromyces hordei Tracy
Hordeum jubatum - Mississippi
Ustilago crameri Koern.
Chaetochloa italica (millet) - Montana, Colorado, Pennsylvania
Ustilago levis (Kell. & Sw.) Magn.
Avena fatua - Kansas
Ustilago neglecta Niessl
Chaetochloa lutescens - Pennsylvania, Kansas
Ustilago panici-miliacei (Pers.) Wint.
Panicum miliaceum - North Dakota
Ustilago perennans Rostr.
Arrhenatherum elatius - Pennsylvania, Missouri
Ustilago pustulata Tr. & Earle
Panicum dichotomiflorum - Kansas
Ustilago rabenhorstiana Kuehn
Syntherisma sanguinalis - Pennsylvania
Ustilago striaeformis (West.) Niessl
Agrostis sp. - Pennsylvania
Agrostis palustris - Pennsylvania
Dactylis glomerata - Pennsylvania
Elymus sp. - Iowa
Poa sp. - Pennsylvania
Poa pratensis - Pennsylvania

References:

1. Craigie, J. H. and William H. Weston, Jr. Observations on malformed tassels of teosinte plants infected with downy mildew. (Abstract) Phytopath. 14: 49. 1924.
2. Drechsler, Charles. A leafspot of redtop caused by an apparently undescribed species of Helminthosporium. (Abstract) Phytopath. 15:49-51. 1925
3. Garrett, A. O. The aecial stage of Puccinia pattersoniana. Mycologia 16: 33-35. 1924.
4. Molz, E. Ueber die Giftigkeit des auf Grasern haufiger schmarotzenden Erstickungsschimmels. The toxicity of the strangulation fungus frequently parasitizing grasses. Deutsche Landw. Press 51: 254. 1924.
5. Monteith, J. Jr., The leafspot disease of bluegrass. Bul. Green Sect. U. S. Golf Assoc. 4: 172-173. July 1924.

6. Oakley, R. A. Brown-patch investigations. Bul. Green Sect. U. S. Golf. Assoc. 4: 87-92. Apr. 1924.
7. Sampson, Kathleen. Seasonal notes on the fungus diseases of grasses in the Aberystwyth district. Agr. Progress (Jour. Agr. Educ. Assoc. 1: 106-107.) 1924.
8. Stakman, E. C. and M. N. Levine. Puccinia graminis on Poa spp. in the United States. (Abstract) Phytopath. 14: 39. 1924.
9. ____________________ Puccinia graminis poae Erikss. and Henn. in the United States. Jour. Agr. Res. 28: 541-548. May 10, 1924.
10. Traverso, G. B. Un antico esemplare di "Sclerospora graminicola" (Sacc.) Schroet. Bul. Soc. Ital. 1924: 75-78. 1924.
11. Weston, W. H., Jr. Nocturnal production of conidia by Sclerospora graminicola. Jour. Agr. Res. 27: 771-784. 1924.

Miss Florence Hedges,
Laboratory of Plant Pathology,
U. S. Department of Agriculture,
Washington, D. C.